Ver 1.32p

ReFlexIO

User Manual

ioSelect

Document Information

Document Control	
Document Title	ReFlexIO User Manual

Symbols Used In This Manual	
	Press: button press sequence
	Information: information about the current section
	Caution: important safety or operational information

Safety Warnings

RF Exposure

CAUTION

9XTend Spread Spectrum Radio, 900 MHz
This equipment is approved only for mobile and base station transmitting devices. Antenna(s) used for this transmitter must be installed to provide a **separation distance of at least 30 cm** from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

XStream Spread Spectrum Radio, 2.4 GHz
This equipment is approved only for mobile and base station transmitting devices. **Separation distances of (i) 20 centimetres or more for antennas with gains < 6 dBi or (ii) 2 meters or more for antennas with gains ≥ 6 dBi** should be maintained between the antenna of this device and nearby persons during operation. To ensure compliance, operation at distances closer than this is not recommended.

Antenna

CAUTION

The ReFlexIO antenna port shall only be connected to internal antennas located within the same building as the ReFlexIO equipment.

Modifications

CAUTION

Use of unauthorised antenna or other changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this product.

Lithium Battery

CAUTION

Only to be serviced by competently skilled Electronics aware personnel.
If battery is removed from the device, it should be returned to the supplier or disposed of in accordance with local regulations.
Risk of explosion if battery is replaced by incorrect type.
Battery type is CR1220 Coin Battery 12mm diameter, 2mm thickness.
Positive side of battery to face upwards when in battery holder.

Fire Risk

CAUTION

A supply voltage above the specified limits may cause fire.

Limited Power Source

CAUTION

The ReFlexIO shall be powered by an approved limited power source compliant with the requirements of IEC60950 -1, clause 2.5.

Safety Extra-Low Voltage (SELV)

CAUTION

The ReFlexIO has been assessed as SELV throughout, all ports shall be connected to approved SELV circuits or an approved isolation unit shall be used.

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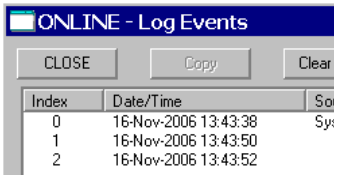
1. Thank You!

Congratulations on your purchase of the Kingfisher ReFlexIO Wireless IO system. Some of the ReFlexIO's best features are shown below. The next chapter - Quick Start, shows how to get your ReFlexIO ready for action super fast!

ReFlexIO Features

OLED Display and 4 status lights



Event logging

3 button data entry and basic configuration

Various comms options: Spread Spectrum Radio card (no radio license required) or Serial Card (can connect an external PSTN modem, GSM, Spread Spectrum Radio, Trio M Series Radio etc.)

Low power consumption

MODBUS or

Responds to Modbus or Kingfisher Series II messages

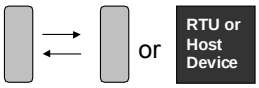
IF input x **THEN** output y

Conditional Outputs

TX RX

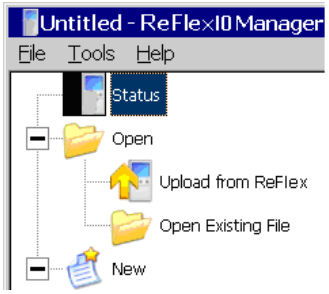
Can initiate communications or respond to poll messages

Connect A GSM to Your ReFlexIO and send an SMS Alarm to your phone



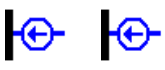
Simple communications – each ReFlexIO communicates with one other device only (another ReFlexIO, a Kingfisher RTU or a Modbus master device)

Can be powered by its mini-USB port when used with ReFlexIO Manager

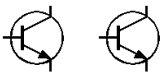


Advanced options can be configured using ReFlexIO Manager.
Get your free copy by contacting ioSelect (www.ioselect.com)

2 Digital Inputs



2 Analog Inputs

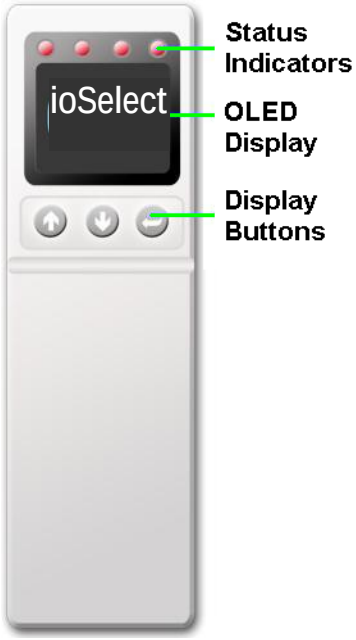


2 Digital Outputs

2 Analog Outputs

2. Quick Start

Read this section if you want to setup your ReFlexIO with minimum effort!



STATUS INDICATORS				
	POWER	IO SCAN	TX/RX	ALARM
	●	●	●	●
STEADY:	OK	ON	TX/RX	-
FLASH:	FAULT	OFF	TX/RX	ALARM

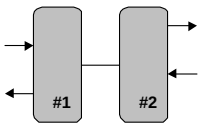
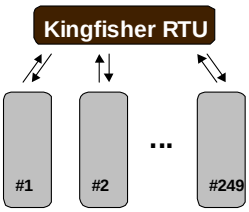
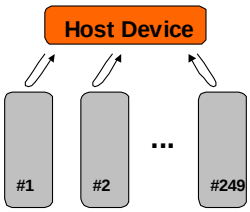
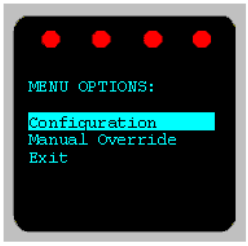
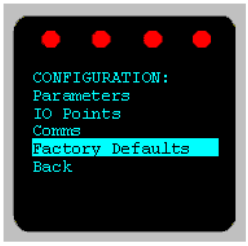
DISPLAY BUTTONS		
UP	DOWN	ENTER / OK
	ESCAPE *	
	BACK * #	

* Press keys together
# Back is used when changing a setting. Allows cursor to move one position backwards.

1. POWER: Power up the ReFlexIO by connecting a DC power supply as shown in the wiring diagram towards the back of this manual.

2. ANTENNA: Ensure that the antenna is connected to the spread spectrum radio board (if installed).

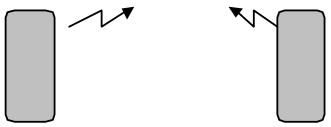
3. OPERATION MODE: A ReFlexIO has 3 operation modes to choose from as detailed below. Note: if you would like to send an SMS, you must select the Modbus Slave operation mode.

Back to Back	Remote IO	Modbus Slave
		
Inputs from one ReFlexIO are transferred to the outputs of the other ReFlexIO and vice versa.	Each ReFlexIO responds to Kingfisher Series II read or write messages and exception reports new data.	Each ReFlexIO responds to Modbus read or write messages. SMS messages can also be sent by the ReFlexIO.
PRESS	**1** Press **ENTER** (the screen below will then be displayed *). With the highlight on **Configuration,** press **ENTER** again.	**2** Select **Factory Defaults** (by pressing the **UP** or **DOWN** buttons) and then press **ENTER**.	**3** Select the defaults you want and then press **ENTER**.
			

* If security has been enabled, you will need to enter a PIN number (please see the Security Access chapter for more information).

4. DEFAULT SETTINGS: The factory defaults will configure the ReFlexIO to have 2 digital inputs, 2 digital outputs, 2 analog inputs (0-20mA) and 2 analog outputs (0-20mA). These settings can be changed from the OLED screen Configuration, IO Points. A list of all the default settings is contained in the Factory Default Settings chapter.

5. DEVICE ADDRESSES: The factory defaults will set the ReFlexIO Local Address to 1 and the Remote Address to 2 (or 0 if in Modbus Slave mode). Each ReFlexIO must have a unique *local* address. The *remote* address may be another ReFlexIO or a KF2 RTU (not applicable in Modbus Slave mode). Note: when configuring the Remote ReFlexIO, these addresses are entered in reverse as illustrated below.



Local Address 1
Remote Address 2

Local Address 2
Remote Address 1

The addresses can be changed from the OLED screen - Configuration, Parameters, Device Addresses.

6. COMMS: Spread spectrum radio settings or Serial Card settings can be changed from the Configuration, Comms OLED screen. Exception reporting can be disabled and the background comms period can also be changed from this screen.

Spread Spectrum radio card: if it is possible that your ReFlexIO will overhear another spread spectrum radio, you may need to change the hopping channel from the Configuration, Comms, SS Radio, Hopping Channel screen. Please ensure that both radios use the same hopping channel. The Vendor ID can also be changed if necessary by using ReFlexIO Manager.

Serial card: the default settings set the baud rate to 4800 bps and the serial type to RS232. If using a PSTN modem or GSM for answering calls or dialling out (dialling out is not supported in Modbus Slave mode), change Serial Type to PSTN. If using a GSM for SMS paging, set serial type to RS232 or PSTN (if wanting to answer calls as well) and baud rate to 9600.

7. PARAMETERS: The Configuration, Parameters OLED screen will allow you to change the ReFlexIO's time and date, SMS destination phone number and PSTN dial-out phone number (a dial-out phone number is not used in Modbus Slave mode). Note: by default, when an SMS phone number is configured, an SMS message will be sent whenever a digital input changes state.

8. ADVANCED CONFIGURATION: *ReFlexIO Manager* allows all the ReFlexIO options to be configured using a PC. Some advanced options include: event logging, spread spectrum radio Vendor ID, number of communication retries, communication timeout, failsafe outputs, PSTN modem settings (eg. initialisation string) and SMS paging (text to send and analog input triggers). Please see the chapter – Advanced Configuration for more details.

9. DRIVERS: To communicate with a ReFlexIO using a KF2 RTU or a Modbus device, please see the chapter – Communication Drivers.

10. CONNECTING DEVICES: To connect an external communication device to your ReFlexIO, please see the chapter – Using Communication Devices.

11. STATUS SCREENS: If you want to know what any of the status information means, please see the chapter – Viewing Data.

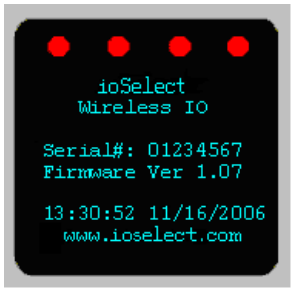
12. FIXED INPUTS AND OUTPUTS: To temporarily set the inputs and outputs to a fixed value, please see the chapter – Manual Override (useful for testing).

Done!

3. Viewing Data

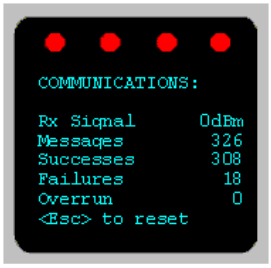
The OLED display shows the status of local and remote data. By pressing the UP or DOWN buttons the following screens can be viewed:

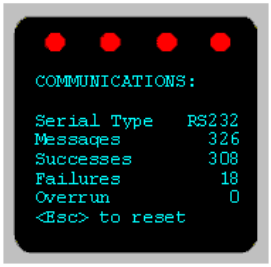
Start-up Screen



Displays Serial No, Firmware revision and current system time.

Communications Status





Displays communications statistics including signal strength and total messages.

Rx Signal [If SS Radio installed]**:** (0, -110 to -40 dBm or 6-54) Radio received signal strength. 0 denotes no signal received while -40 dBm or 54 denotes excellent signal strength. Note: the 9XTend radio uses the dBm range while the 24XStream radio uses the 6-54 range. Value is updated automatically every 2 minutes. To request an immediate update, press both the middle and right buttons.

Serial Type [If Serial card installed]**:** (RS232 or RS485) Serial interface type of the Serial option board.

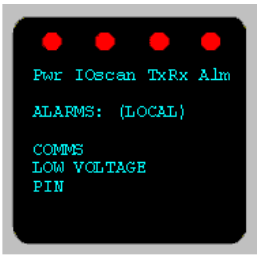
Messages: Total number of initiated messages (ie. exception reports and polls) since the last power up. A message is only counted after successful communications or after all the retries have expired. Displays ‘N/A’ when in Modbus Slave mode (ReFlexIO does not initiate messages).

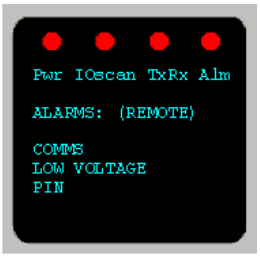
Successes: Number of successful initiated messages since the last power up. Displays ‘N/A’ when in Modbus Slave mode (ReFlexIO does not initiate messages).

Failures: Number of communication failures since the last power up. A failure is counted for each failed message (after all retries for that message have failed). Displays ‘N/A’ when in Modbus Slave mode (ReFlexIO does not initiate messages).

Overrun: The ReFlexIO has an 8-message communications buffer. If a new message is generated when the buffer is full, it is ignored and counted as an overrun. Overruns indicate that the ReFlexIO is generating excessive exception reports or is polling too fast. Displays ‘N/A’ when in Modbus Slave mode (ReFlexIO does not initiate messages).

View Alarms





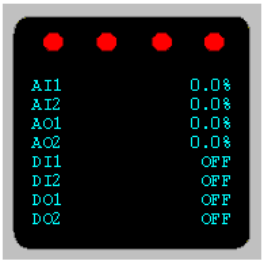
Displays any local or remote* alarms in the system.

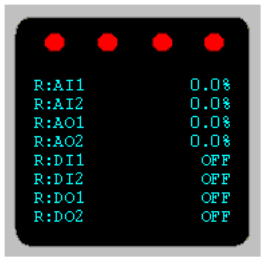
Comms: Communications failure to remote device. Reset after a successful poll or exception report or after a power reset. A communications fail will cause the ReFlexIO to enter failsafe mode and set all *remotely controlled* outputs to failsafe values (if failsafe has not been disabled using ReFlexIO Manager).

PIN: Set if incorrect PIN has been entered 3 times. Reset on successful PIN or power reset.

Low Voltage: Supply voltage is below the low voltage setpoint. Reset when the supply voltage is restored to or above the low voltage setpoint (10.8V by default)

View IO Status



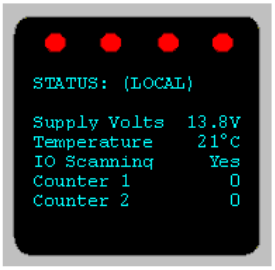


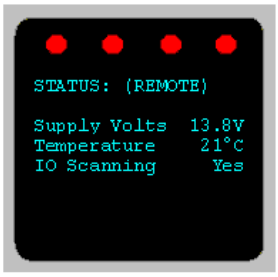
Displays the current local and remote* IO (input and output) status.

Remote IO Status:
Remote IO Status is automatically updated after each poll. To request an immediate update, press both the middle and right buttons.

* Remote data is not displayed when in 'Remote IO' operation mode

View Status





Displays local and remote* status data.

Supply Volts: (9.0-30.0V DC). The input supply voltage.

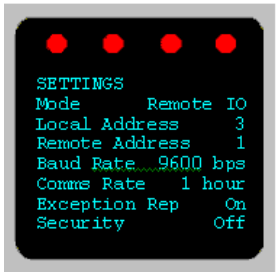
Temperature: (-20 to 70°C)

IO Scanning: (Yes, No) If Yes, the inputs are read and the outputs are set at the configured IO Scan Rate. IO Scanning can be set off from the Manual Override screen. IO Scanning is also automatically stopped while the Configuration screen is active.

Counter 1, Counter 2: (0-4,294,967,295) As configured by ReFlexIO Manager. To reset the counters, press both the left and middle buttons. (Counters are not displayed for the remote ReFlexIO.)

* Remote data is not displayed when in 'Remote IO' operation mode

Settings Screen



Displays configuration information.

Mode: (Remote IO, Back To Back or Modbus Slave) Operation mode. Can be changed from the screen - Configuration, Factory Defaults.

Local Address: The address of the local ReFlexIO.

Remote Address: The address of the remote ReFlexIO or Host RTU. Displays '0' when in Modbus Slave mode (ReFlexIO does not initiate any messages).

RF Data Rate [If SS radio installed]**:** (9600 or 19200 bps) Radio frequency data rate of the spread spectrum radio.

Baud Rate [If Serial card installed]**:** (4800, 9600, 19200 or 38400 bps) Data rate of the serial option card.

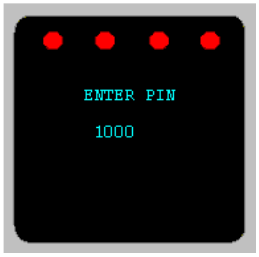
Comms Rate: How often to poll the remote ReFlexIO or Host RTU. Displays 'N/A' when in Modbus Slave mode (ReFlexIO does not initiate messages).

Exception Report: When ON allows the local ReFlexIO to notify the remote ReFlexIO or host RTU when any IO changes.

Security: When ON a PIN number must be entered before anything can be changed

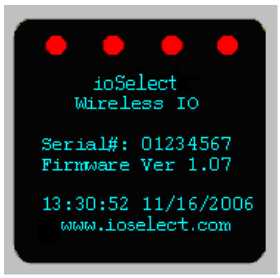
4. Security Access

This chapter is only relevant if security has been enabled on your ReFlexIO (security is disabled by default).



Screen displayed when **ENTER** is pressed and security is enabled. Press **ENTER** to change between digits and press the **UP** or **DOWN** buttons to change the value of each digit. 1000 is the default PIN. If an incorrect PIN is entered 3 times in a row, the screen below will be displayed.

During Security Lockout, only the status screens can be viewed. The Configuration or Manual Override settings cannot be changed. A Security Lockout will last for 30 minutes by default. Resetting the ReFlexIO power supply will allow you to enter a PIN number again without having to wait for 30 minutes.



Recovering A ReFlexIO When PIN not Known

With the startup screen or a status screen displayed, press and hold the **UP** (left) and **ENTER** (right) buttons for 5 seconds. An 8 digit Unlock Key will then appear as shown below.

⚠Caution! When an Unlock Key is generated by the ReFlexIO, the configured PIN number is cleared and replaced by a new value.

Supply the Unlock Key to ioSelect (www.ioselect.com). You will then be issued with a temporary PIN to gain access into the ReFlexIO to change your PIN.

Power-up Security Fail

The ReFlexIO has failed its power-up security check. Please return the ReFlexIO to your distributor.

5. Configuration (Using Display Buttons)

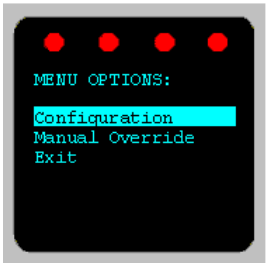
The most common ReFlexIO options can be configured using the 3 display buttons. All of these options are described below. Changes are only activated when the configuration mode is exited. Note: If a button has not been pressed for 3 minutes (by default), the ReFlexIO will automatically exit the configuration screen and return to IO display mode. Additional options can be configured using ReFlexIO Manager as described in the chapter - Advanced Configuration.

Configuration - Parameters

PRESS

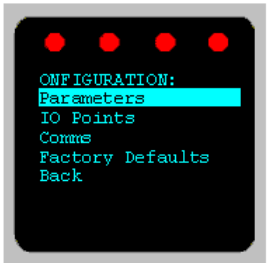
1

Press **ENTER** (the screen below will then be displayed). With the highlight on **Configuration,** press **ENTER** again.



2

With the highlight on **Parameters,** press **ENTER** again



3

Select the parameter you want to change (by pressing the **UP** or **DOWN** buttons) and then press **ENTER**

Device Addresses: (001-249) Allows the local and remote device address to be set. Ensure these are set to different addresses eg. 1 and 2. The remote address may be another ReFlexIO, ioPro-WDL or a Kingfisher RTU. The Remote address is automatically set to 0 in Modbus Slave mode.

Time & Date: Allows time to be set in the format HH.MM.SS and the Date to be set in the format DD:MM:YYYY.

Network ID: (00 to FF Hex, default=AE) The Network ID is used at the start of all messages. Only messages that have the same Network ID are recognised and processed by the local ReFlexIO. If there are two ReFlexIO networks that could overhear one another, it is recommended that each network have its own Network ID. To minimise interference from another device using a spread spectrum radio, please see the section Configuration - Comms, SS Radio, Hopping Channel.

IO Scan Rate: (250ms, 1s, 5s, 30s, 1min, 5min, 15min) The period at which the ReFlexIO scans all its IO.

Security: (Enable PIN, Disable PIN, Set PIN) When Enable PIN is selected, a PIN number will be required before entering the Configuration or Manual Override screens.

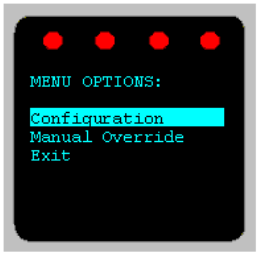
Phone Numbers: (blank or up to 19 digits) Allows the SMS destination phone number and the PSTN dial-out phone numbers to be configured. The first blank character ends the phone number eg. if 9876_5432 is configured, the number dialled will be only 9876. A phone number can be cleared by setting the first digit to blank. Note: configuring an SMS phone number will enable the SMS message to be triggered by a change in one of the digital inputs (by default).

Configuration - IO Points

PRESS

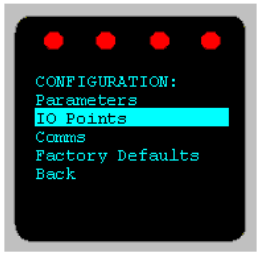
1

Press **ENTER** (the screen below will then be displayed). With the highlight on **Configuration,** press **ENTER** again.



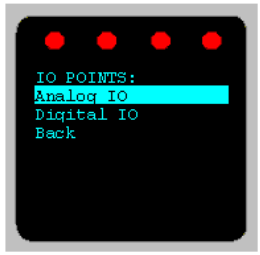
2

Select **IO Points** (by pressing the **DOWN** button) and then press **ENTER**



3

Select **Analog IO** or **Digital IO** and then press **ENTER**



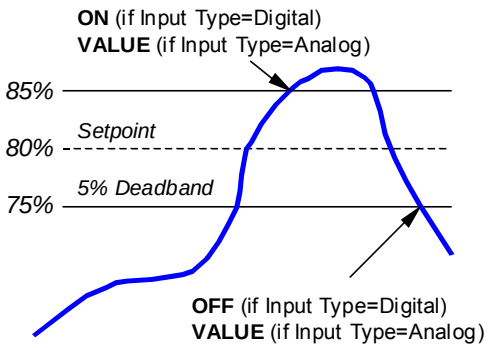
Analog IO - AI1 Settings / AI2 Settings

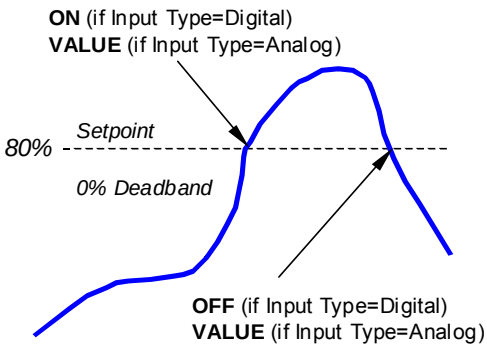
Input Type: (Digital or Analog) If set to digital, the input is registered as ON or OFF according to the Setpoint and Deadband settings (as detailed below). If set to Analog, the analog value is measured and an exception report is triggered according to the Setpoint and Deadband settings.

Analog Range: (0-20mA or 4-20mA) The current range of the analog input device. Only relevant if Input Type = Analog.

Setpoint: (000.0 to 100.0 %) If Input Type is set to digital, the input is registered as ON and an exception report is requested when the input rises above the Setpoint plus Deadband settings. The input is registered as OFF and an exception report is requested when the input falls below the Setpoint minus Deadband settings.

Dead Band: (000.0 to 100.0 %) Deadband is an area of the input range where no action occurs. When Input Type is set to Digital, deadband is used with Setpoint to determine when the input is ON or OFF. When Input Type is set to Analog, Deadband is the amount the input must change to trigger an exception report. Examples:





Analog IO - AO1 Settings / AO2 Settings

Output Type: Digital or Analog.

Analog Range: 0-20mA or 4-20mA (only relevant if Output Type = Analog).

Failsafe: (000.0 to 100.0 %) Value to output in failsafe state.

ON Value: (000.0 to 100.0 %) Value to output when configured as a Digital output.

OFF Value: (000.0 to 100.0 %) Value to output when configured as a Digital output. Typically set to 0 %.

Digital IO

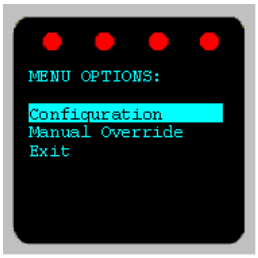
DO1 Failsafe / DO2 Failsafe: (ON or OFF) Value to output in failsafe state (if enabled).

Configuration - Comms

PRESS

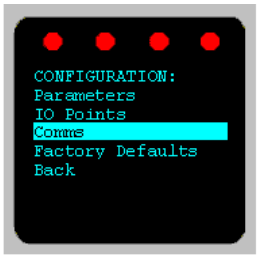
1

Press **ENTER** (the screen below will then be displayed). With the highlight on **Configuration,** press **ENTER** again.



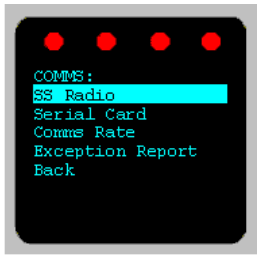
2

Select **Comms** (by pressing the **DOWN** button) and then press **ENTER**



3

Select the comms option you wish to configure and then press **ENTER**



SS Radio (if installed *)

ⓘ Note: the following settings can be changed after the radio has been powered for more than 30 seconds.

Hopping Channel: (XTend radios: 0-9, XStream radios 0-6, default=0) Each pair of ReFlexIO spread spectrum radios must be set to the same hopping channel to enable them to communicate. To minimise interference from another ReFlexIO or device using a spread spectrum radio, a hopping channel that is different to the offending radio should be used.

RF Data Rate: (Normal or High) Normal sets the transmission rate to 9600 bps and High sets the transmission rate to 115,200 bps. It is best to use Normal for most networks particularly when transmitting over long distances. Note: this setting is not applicable for XStream spread spectrum radios.

Serial Card (if installed *)

Type: (RS232, RS485 or PSTN) Serial interface type of the serial card. PSTN allows a dial-out phone number to be configured. To send an SMS, select RS232 or PSTN. The initialisation string and other dialling settings can also be changed using ReFlexIO Manager.

Baud Rate: (4800, 9600, 19200 or 38400 bps) Serial card baud rate.

Comms Rate: (500ms, 1s, 5s, 30s, 1 minute, 15 minutes, 30 minutes, 1 hour, 1 day) How often to poll the remote device. If the ReFlexIO receives a message, it resets its poll timer and starts timing again. Note: Comms Rate must be set at least as long as the communications link 'Timeout' (as set using the ReFlexIO Manager software; default=800ms). Disabled when ReFlexIO is in Modbus Slave mode. A Comms Rate of 5 seconds or greater should be used for PSTN communications to avoid overruns.

Exception Report: (Yes or No) When set to Yes, a communications message will be transmitted when a digital input changes state, an analog input rises above the setpoint plus deadband settings, an analog input falls below the setpoint minus deadband settings or an alarm is triggered. Disabled when ReFlexIO is in Modbus Slave mode.

* An option card can only be configured after the ReFlexIO has detected it. The ReFlexIO will automatically detect the option card when the ReFlexIO is reset to Factory Defaults (please see the topic Configuration, Factory Defaults.

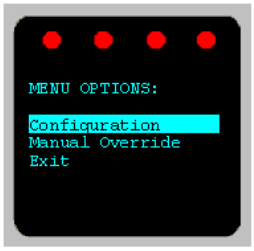
Configuration - Factory Defaults

Loads the default settings corresponding to 'Back To Back', 'Remote IO' or ‘Modbus Slave’ as listed in the Factory Default Settings chapter of this manual. Note: the ReFlexIO will automatically detect the option card type and load the corresponding defaults (if no option card is installed, the Serial Card defaults will be loaded).

PRESS

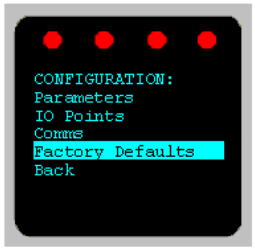
1

Press **ENTER** (the screen below will then be displayed). With the highlight on **Configuration,** press **ENTER** again.



2

Select **Factory Defaults** (by pressing the **DOWN** button) and then press **ENTER**



3

Select the factory defaults you require and then press **ENTER**

Selecting any of the **Factory Defaults** will overwrite user changes to the Parameters (eg. addresses), IO Points and Comms settings. Any user settings will need to be re-configured.

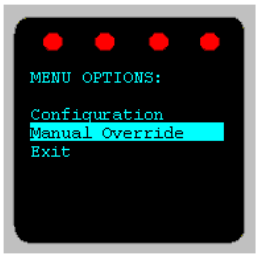
6. Manual Override

The value of both the inputs and the outputs can be forced to any state from this screen. When the screen is exited, the input and output values will be restored to their former values if scanning is left set to ON. If scanning is turned OFF or set to a time delay, the manual values will be maintained until scan is set back ON or the scanning delay expires. This screen is automatically exited after 3 minutes (by default) of inactivity.

PRESS

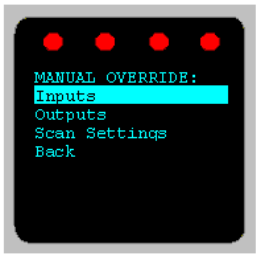
1

Press **ENTER** (the screen below will then be displayed). Select **Manual Override** (by pressing the **DOWN** button) and then press **ENTER**.



2

Select **Inputs** or **Outputs** (by pressing the **DOWN** button) and then press **ENTER**



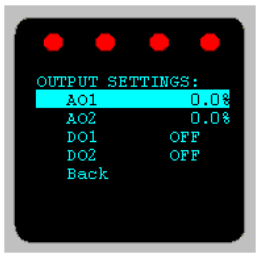
3

Select the IO you wish to override such as **AI1** and press **ENTER**

Manual Override - Inputs

AI1: (0.0 - 100.0 %) Analog Input 1
AI2: (0.0 - 100.0 %) Analog Input 2
DI1: (ON, OFF) Digital Input 1
DI2: (ON, OFF) Digital Input 2

Manual Override - Outputs

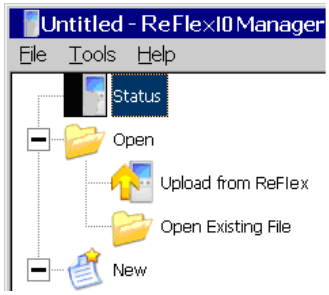


AO1: (0.0 - 100.0 %) Analog Output 1
AO2: (0.0 - 100.0 %) Analog Output 2
DO1: (ON, OFF) Digital Output 1
DO2: (ON, OFF) Digital Output 2

Manual Override - Scan Settings

Scan Select: (OFF, ON, 30 minutes, 4 hours, 1 day) When the Manual Override screen is exited, if Scan Select is set OFF or set to a time delay, the input and output override settings will be maintained until scan is set back ON or the Scan Select delay expires.

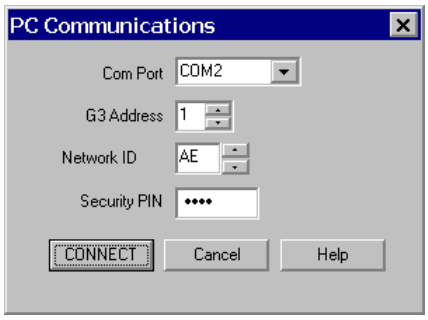
7. Advanced Configuration (Using ReFlexIO Manager)



ReFlexIO Manager allows all the ReFlexIO options to be configured and saved in a configuration file. The configuration file can then be downloaded into a ReFlexIO. ReFlexIO Manager can also upload the configuration that is currently running in a ReFlexIO. All the ReFlexIO Manager settings are described in this chapter.

Advanced – PC Communications

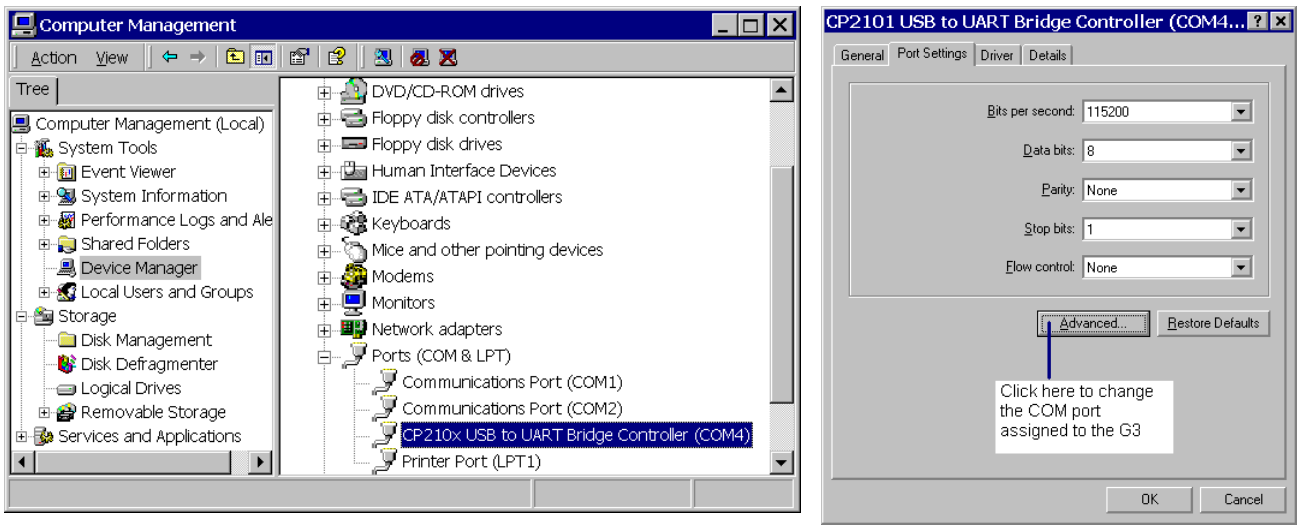
When attempting to communicate with your ReFlexIO for the first time, ReFlexIO Manager will display the following window.



ReFlexIO Manager uses one of the PC's USB ports to communicate with the ReFlexIO. After connecting a ReFlexIO to your PC using a USB to mini USB cable, please ensure that the ReFlexIO Address, Network ID and Security PIN match the settings in the ReFlexIO. Click CONNECT to attempt to communicate with the ReFlexIO. Note: the ReFlexIO can be powered by its mini USB port when used with ReFlexIO Manager (the communications option board is not powered using this setup).

Please see the chapter - Upgrading Firmware for more information about upgrading firmware.

Com Port: (COM1 to COM9) Windows assigns a COM port number to the ReFlexIO device. Usually it will be the highest COM port number in the pull down list. You can check which COM port has been assigned by connecting a ReFlexIO to your PC. Go to the Windows desktop, right-click My Computer and select Manage. A window will appear (as shown below). Click Device Manager on the left hand side of the window. Then double-click Ports on the right hand side. The COM port assigned to the CP210x device (as used for the ReFlexIO) will then be displayed as shown below.



Note: ReFlexIO Manager will only accept up to COM9. If COM10 or higher has been assigned to the ReFlexIO port, this can be changed by double-clicking 'CP210x USB to…' (as shown above) and assigning a lower COM port number.

ReFlexIO Address: (1-249) This setting must match the Local Address configured in the ReFlexIO. The Local Address can be checked by viewing the SETTINGS screen on the ReFlexIO.

Network ID: (00 to FF Hex, default=AE) This setting must match the Network ID configured in the ReFlexIO. If the default setting has been changed, it can be checked from the ReFlexIO screen - Configuration, Parameters, Network ID.

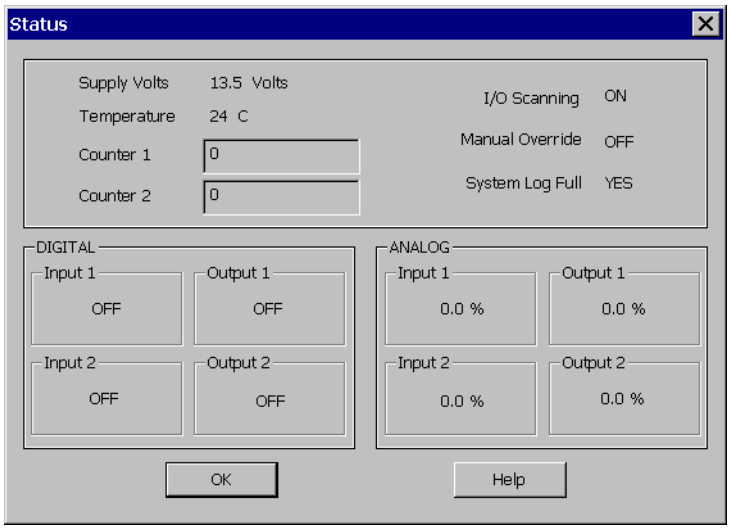
Security PIN: (0000-9999, default=1000) This setting must match the PIN number configured in the ReFlexIO. ReFlexIO Manager requires the Security PIN number even if security is disabled in the ReFlexIO. Please see the topic Security Access if the PIN number is not known.

Advanced – Upload From ReFlexIO

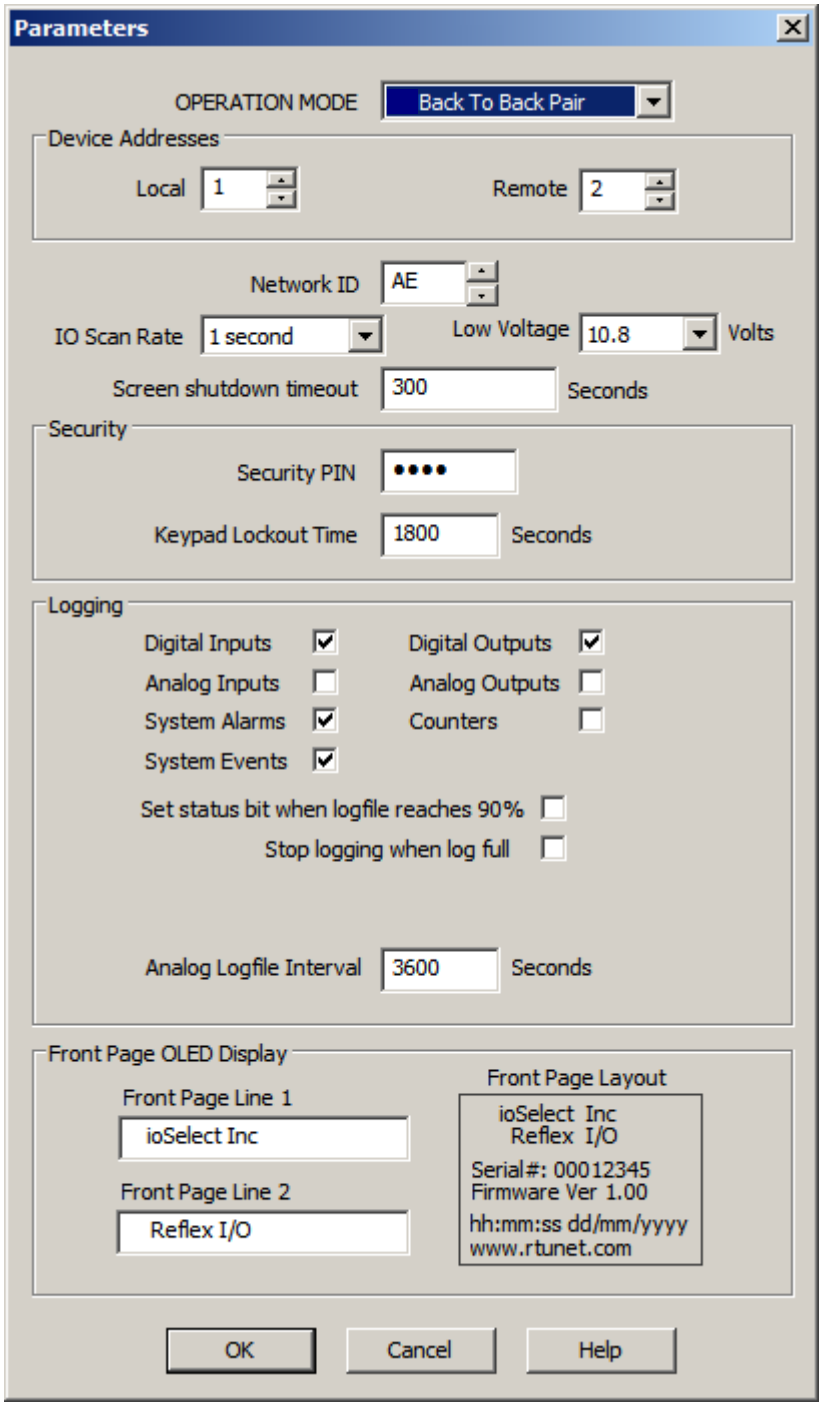
Uploads the ReFlexIO configuration into ReFlexIO Manager. The configuration can then be updated and downloaded back into the ReFlexIO. Note: please ensure that the latest versions of ReFlexIO firmware and ReFlexIO Manager are being used to ensure version compatibility.

Advanced - Status

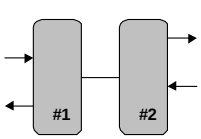
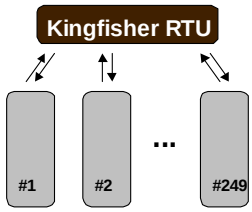
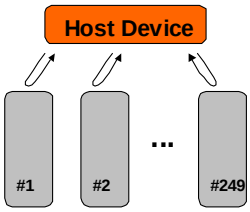
Displays the current status of IO and other parameters in the ReFlexIO. Values are refreshed once a second.



Advanced - Configuration – Parameters



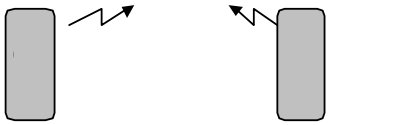
Operation Mode: (ReFlexIO Back to Back Pair, ReFlexIO Remote I/O, Modbus Slave)
Loads default settings for the selected operation mode as described below. Note: if you would like to send an SMS, you must select the Modbus Slave operation mode.

Back to Back	Remote IO	Modbus Slave
		

Inputs from one ReFlexIO are transferred to the outputs of the other ReFlexIO and vice versa.	Each ReFlexIO responds to Kingfisher Series II read or write messages and exception reports new data.	Each ReFlexIO responds to Modbus read or write messages. SMS messages can also be sent by the ReFlexIO.

For all modes, the default settings will configure the ReFlexIO to have 2 digital inputs, 2 digital outputs, 2 analog inputs (0-20mA) and 2 analog outputs (0-20mA). For a list of all the default settings, please see the chapter - Default Settings. The default settings can all be configured using ReFlexIO Manager.

Device Addresses: (Local: 001-249, Remote: 1-249) Allows the local and remote device address to be set. Each ReFlexIO must have a unique *local* address. The *remote* address may be another ReFlexIO, an ioPro-WDL or a Kingfisher RTU (not applicable in Modbus Slave mode). Note: when configuring the Remote ReFlexIO, these addresses are entered in reverse as illustrated below.



Local Address 1
Remote Address 2

Local Address 2
Remote Address 1

Network ID: (*00-FF Hex, Default=AE)* The Network ID is used at the start of all messages. Only messages that have the same Network ID are recognised and processed by the ReFlexIO. If there are two ReFlexIO networks that could overhear one another, it is recommended that each network have its own Network ID. To minimise interference from another device using a spread spectrum radio, please see the topic Configuration, Communications, Hopping Channel.

IO Scan Rate: (250ms, 1s, 5s, 30s, 1min, 5min, 15min) The time period at which the ReFlexIO scans all its IO. Note: the IO Scan Rate should be fast enough to allow the ReFlexIO to detect each IO change. Eg. if a digital input changes from ON to OFF and then back to ON again between IO Scans, the ReFlexIO will not detect or respond to this change.

Low Voltage: (9.0 – 25.5 V, default=10.8 V) When the supply voltage drops below this setpoint, a low voltage alarm is triggered.

Screen Shutdown Timeout: (1 – 3600 seconds, default=300 seconds [5 minutes]) If a button has not been pressed for this amount of time, the ReFlexIO will automatically switch off the OLED display to conserve power and exit from any data entry screen.

Security PIN Number: (0000 - 9999, default=1000) The PIN number is used to protect the ReFlexIO screens from unauthorised access. Once the PIN is enabled from the ReFlexIO display, it will request the PIN every time the display is accessed.

Keypad Lockout Time: (0-65535 seconds, default=1800 seconds [30 minutes]) If an incorrect PIN number is entered 3 times since the last correct PIN, a PIN alarm will be triggered and a new PIN number will not be able to be entered for this amount of time. Setting 0 will disable this function.

Logging

The ReFlexIO is able to store up to 1000 logs. Each log has a time and date stamp accurate to 1 second. Logs are kept in battery backed memory and are maintained even if the ReFlexIO is un-powered.

Digital Inputs: logged on change of state when enabled.

Digital Outputs: logged on change of state when enabled.

Analog Inputs: logged periodically according to the 'Analog Logfile Interval' (as detailed below) when enabled.

Analog Outputs: logged periodically according to the 'Analog Logfile Interval' (as detailed below) when enabled.

System Events: logged on change when enabled.

System Alarms: logged on change when enabled.

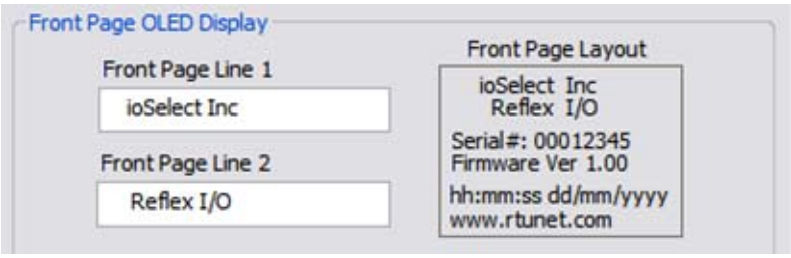
Counters: logged each time the counter trigger setpoint is reached when enabled.

Set Status Bit When Logfile Reaches 90%: When the log file reaches 90% full (900 logs), a bit is set in a ReFlexIO register than can be accessed by SCADA systems. A function can be written in the host RTU that downloads the logs from the ReFlexIO depending on the status of this bit. For further information on accessing the ReFlexIO registers, please see the chapter Communication Drivers.

Stop Logging When Log Full: Stops logging events once the log file is full (1000 events). The ReFlexIO will start logging again once the logs are cleared using ReFlexIO Manager.

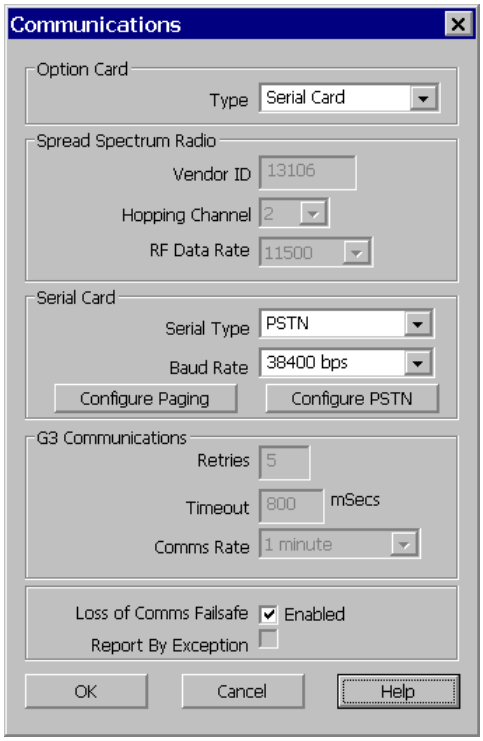
Analog Logfile Interval: (0 - 65535 seconds, default=3600 seconds=1 hour) If logging of Analog inputs or outputs is enabled, the data will be logged periodically according to this setting. Setting 0 disables this function.

Front Page OLED Display: (2 lines of up to 19 ASCII characters per line) The first two lines displayed on the OLED start-up screen. Note: the way these lines will appear on the OLED screen is shown to the left of these settings (Front Page Layout). Spaces can be inserted at the beginning of each line to centre the text.



Advanced - Configuration – Communications

A number of communication options can be configured according to the Option Card, Serial Type and the Operation Mode that has been selected. Options that do not apply to each selection are grayed out.



Option Card

Type: (SS Radio or Serial Card) The installed option card. If no option card is installed, the ReFlexIO uses the Serial Card default settings. After uploading a configuration, this setting will display how the ReFlexIO option card was last *configured* (the ReFlexIO will detect the *installed* option card if reset to factory defaults using the OLED display buttons). Note: if a Type is specified using ReFlexIO Manager that does not match the configured option card in the ReFlexIO, ReFlexIO manager will give a warning. The mismatched configuration can still be downloaded but the option card will no longer work.

Spread Spectrum Radio

(Configurable when Option Card **Type** is set to SS Radio)

Vendor ID: (XTend: 0-32767, XStream: 16-32767, default=13106) Sets the ID number of the Spread Spectrum radio. All radios on the same network need to have the same Vendor ID in order to communicate with each other. It is recommended that you change the Vendor ID to avoid interference with other spread spectrum radio networks.

Hopping Channel: (XTend: 0-9, XStream: 0-6, default=0) Each pair of ReFlexIO spread spectrum radios must be set to the same hopping channel to enable them to communicate. To minimise interference from another ReFlexIO or device using a spread spectrum radio, a hopping channel that is different to the offending radio should be used.

RF Data Rate: (Normal [default] or High) Normal sets the transmission rate to 9600 bps and High sets the transmission rate to 115,200 bps. It is best to use Normal for most networks particularly when transmitting over long distances. Note: this setting is only applicable for XTend spread spectrum radios.

Serial Card

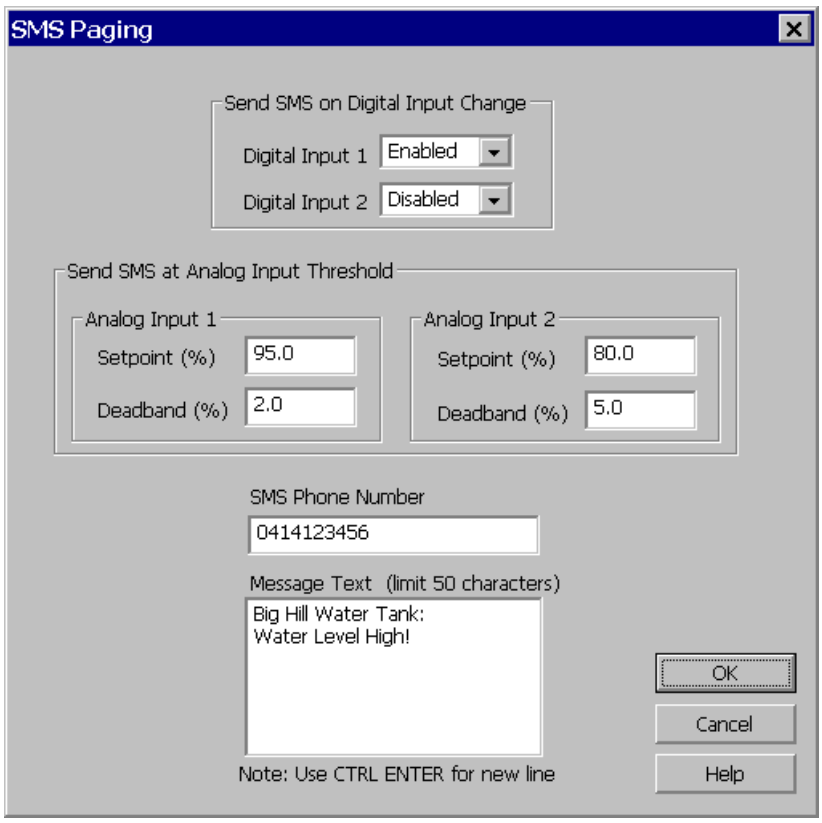
(Configurable when Option Card **Type** is set to Serial Card)

Serial Type: (RS232, RS485 or PSTN) PSTN allows an initialisation string to be set to the external modem, manages dialling out (not applicable to Modbus Slave mode) and allows the modem to answer calls. When using PSTN, the ReFlexIO will wait for a Carrier Detect signal before transmitting a message. For SMS paging, a serial type of RS232 or PSTN can be used. Use RS232 if an initialisation string is not required and the modem/GSM does not need to dial out.

Baud Rate: (4800, 9600, 19200 or 38400 bps) Uses a data format of 8 data bits, 1 stop bit, no parity bit.

Configure Paging Configure Paging

This button only appears when **Option Card Type** is set to Serial Card and **Serial Type** is set to RS232 or PSTN and **Operation Mode** is set to ReFlexIO Modbus Slave (as configured in Advanced – Configuration - Parameters, Operation Mode). Click this button to configure SMS paging settings (requires an external GSM modem). The external GSM modem must also be capable of sending SMS messages in text mode (PDU format is not supported). Note: new SMS messages are discarded if the GSM is already online.



Send SMS on Digital Input Change: (Enabled [default] or Disabled) An SMS message will be triggered when an enabled input changes state.

Send SMS at Analog Input Threshold: (0.0 [default] to 100.0%) An SMS message will be triggered when the analog input rises above the Setpoint plus the Deadband or if it falls below the Setpoint minus the Deadband. Eg. as shown above, an SMS message will be triggered when analog input 1 exceeds 97.0% or falls below 93.0%. No SMS messages will be sent if Setpoint is set to 0.0%.

SMS Phone Number: (up to 20 digits) The SMS destination phone number (where to send the SMS message to). If this phone number is blank, SMS paging is disabled.

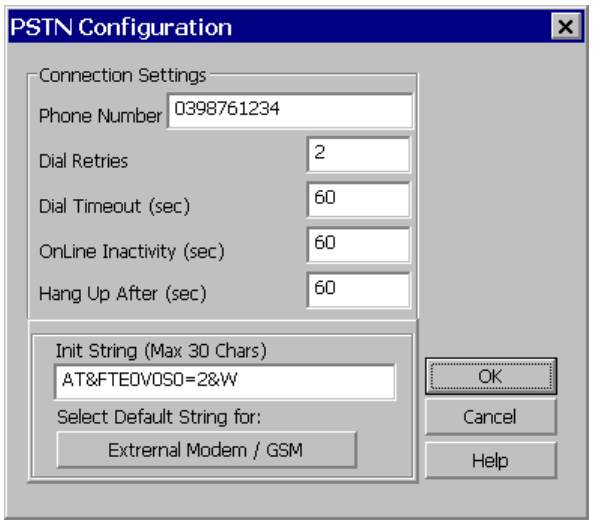
Message Text: (Blank or up to 50 ASCII characters). The SMS message to send when an enabled analog or digital input is triggered. Note: if Message Text is blank, the ReFlexIO will send the following default message:

"ReFlexIO **#address**,D1 **state**,D2 **state**,A1 **value**,A2 **value**,19:34,28/07"

Where **address** is displayed as 1-249 [the ReFlexIO's local address], **state** is displayed as 0 [OFF] or 1 [ON] and **value** is displayed as 0-100 [%]. The time and date stamp (HH:MM, DD/MM) is taken from the ReFlexIO's clock when the alarm is triggered.

Configure PSTN

This button only appears when **Option Card Type** is set to Serial Card and **Serial Type** is set to PSTN. Click this button to configure PSTN dial-out settings (requires an external PSTN modem or GSM). Note: Dialling out is not supported in Modbus Slave operation mode (however, the ReFlexIO can still answer incoming calls).



Phone Number: (Blank or up to 20 digits) The phone number of the remote modem. The ReFlexIO dials this number whenever it needs to transmit a message (ie. to send an exception report or to perform a background poll). When a connection is established (ie. Carrier Detect is present), the message is then transmitted. Note: If Phone Number is left blank, the ReFlexIO will not attempt to dial.

Dial Retries: (0-9) The number of times that the ReFlexIO will attempt to re-dial the remote modem. If Dial Retries is set (ie. non-zero) and a connection is not established within the Dial Timeout (please see below), the ReFlexIO will hang up and then immediately dial again. The ReFlexIO will keep redialling until a connection is established or the Dial Retries are exhausted.

Dial Timeout (sec): (0-999) The ReFlexIO will wait for this amount of time to establish a connection (ie. for carrier detect to be present. Carrier detect usually occurs a short time after the remote modem has answered). Time is counted from when dialling is initiated. Dial Timeout should be set to at least 30 seconds when dialling a PSTN modem or at least 45 seconds when dialling a GSM.

Automatically Hanging Up

A ReFlexIO can be configured to automatically hang up after a certain amount of time has elapsed from *sending* the last message or from *receiving* the last message. There are two parameters used to specify these times and the parameter that is used is dependent on whether the last message was transmitted or received. If the last message was transmitted, the ReFlexIO will wait for 'Hang Up After' seconds and then hang up. If the last message was received, the ReFlexIO will wait for 'On Line Inactivity' seconds and then hang up.

On Line Inactivity (sec): (0-999) The ReFlexIO will hang up after this amount of time has elapsed since the last message *received*. A value of 0 disables the function.

Hang Up After (sec): (0-999) The ReFlexIO will hang up after this amount of time has elapsed after connection or after *sending* the last message. A value of 0 disables this function.

Remaining Online
To remain online after connection, set 'On Line Inactivity' to 0 and 'Hang Up After' to 0 in *both* ReFlexIOs in the PSTN link. If the line is disconnected, the ReFlexIO will reconnect when the next message is initiated.

Init String (Max 30 Chars): The initialisation string to send to the modem on power up and on exit from the configuration menu. By clicking the External Modem / GSM button, the Initialisation String will be set to AT&FTE0V0S0=2&W. Note: the external modem must be powered up when the ReFlexIO sends the initialisation string.

ReFlexIO Communications

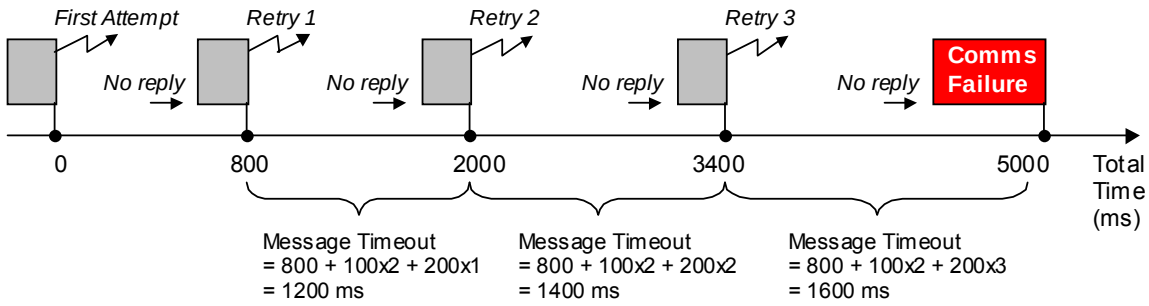
(Not configurable if **Operation Mode** is set to **ReFlexIO Modbus Slave** in the Parameters section)

Retries: (0-10, default=5) Number of times to retry sending a message if the previous attempts have failed. Once all retries have failed, a communications fail is signalled.

Timeout: (0-32767 x10 milliseconds, default=80=800ms) The time that the ReFlexIO will wait for a reply to the *first* message attempt before trying again. The timeout is increased for each successive attempt according to the following formula:

Message Timeout (ms) = Timeout (ms) + (100 x [Remainder of (ReFlexIO Address/8)]) + (200 x Retry Number)

Example: ReFlexIO (address 10) attempts to send a message with 3 retries. Timeout = 800ms. (Note Remainder of ReFlexIO Address 10 divided by 8 = 2). If all attempts fail, a comms failure alarm is signalled after 5000 ms (5 seconds).



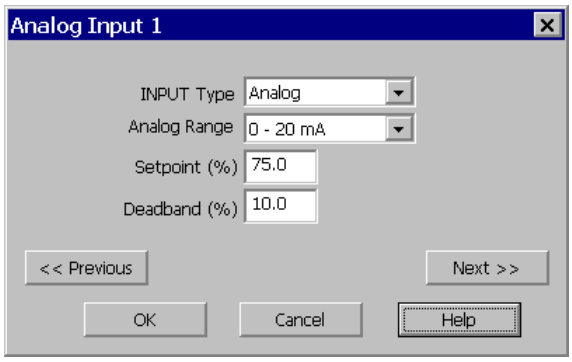
Comms Rate: (500ms, 1s, 5s, 30s, 1 minute, 15 minutes, 30 minutes, 1 hour, 1 day) How often to poll the remote device. If the ReFlexIO receives a message, it resets its poll timer and starts timing again. Note: Comms Rate should be at least as long as the communications link Timeout (as detailed above) to avoid communication overruns (too many messages).

Loss Of Comms Failsafe: When enabled the ReFlexIO will set its analog and digital outputs to the configured failsafe settings when a comms failure alarm occurs. If disabled, outputs will hold last state on comms failure.

Report By Exception: When enabled a communications message will be transmitted when a digital input changes state, an analog input changes by more than the deadband setpoint or a system alarm occurs. -

Advanced - Configuration – IO Points

Analog IO - Analog Inputs

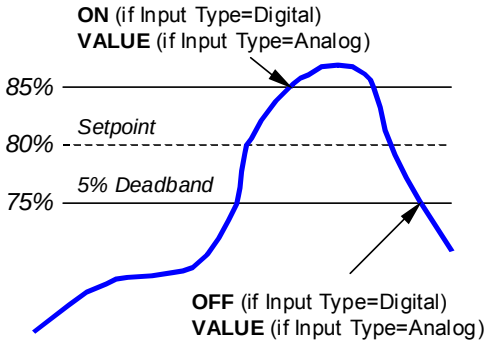


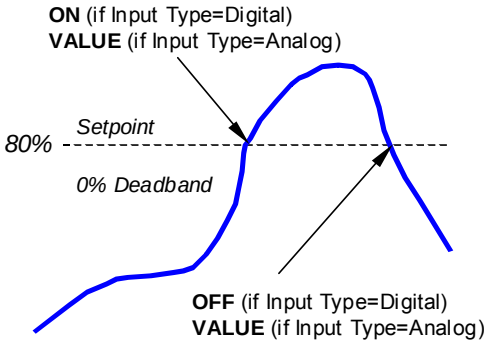
Input Type: (Digital or Analog) If set to digital, the input is registered as ON or OFF according to the Setpoint and Deadband settings (as detailed below). If set to Analog, the analog value is measured.

Analog Range: (0-20mA or 4-20mA) The current range of the analog input device. Only relevant if Input Type = Analog.

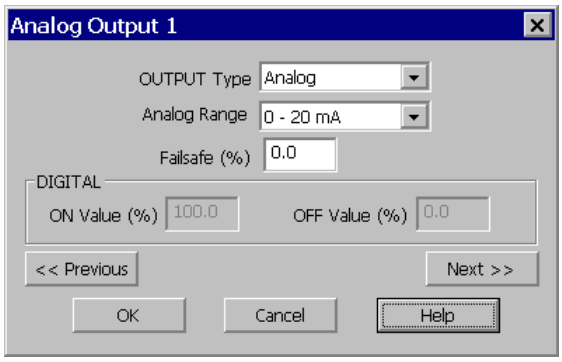
Setpoint: (000.0 to 100.0 %) If Input Type is set to digital, the input is registered as ON when the input is greater than the Setpoint plus Deadband settings. The input is registered as OFF when the input is less than the Setpoint minus Deadband settings.

Deadband: (000.0 to 100.0 %) Deadband is an area of the input range where no action occurs. When Input Type is set to Digital, deadband is used with Setpoint to determine when the input is ON or OFF. When Input Type is set to Analog, Deadband is the amount the input must change to trigger an exception report. Examples:





Analog IO - Analog Outputs



Output Type: (Digital or Analog) When set to Analog, the ReFlexIO will output either 0-20mA or 4-20mA.
When set to Digital, the ReFlexIO will output the ON Value or OFF Value as detailed below.

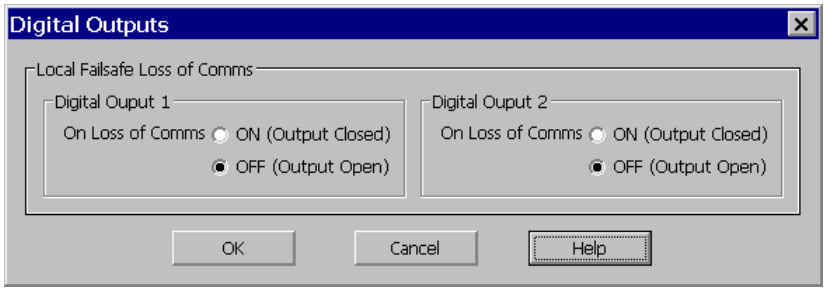
Analog Range: (0-20mA [default] or 4-20mA) The current range of the Analog Output.

Failsafe: (000.0 to 100.0 %) Value to output in failsafe state. Failsafe is only activated if Loss Of Comms Failsafe has been enabled in Advanced - Configuration, Communications and the output is being controlled by the remote device.

ON Value: (000.0 to 100.0 %, default=100%) Value to output when Output Type is set to Digital. Eg. If the ON value is 100% and the Analog Range is 0–20mA, then the analog output when ON will be 20mA.

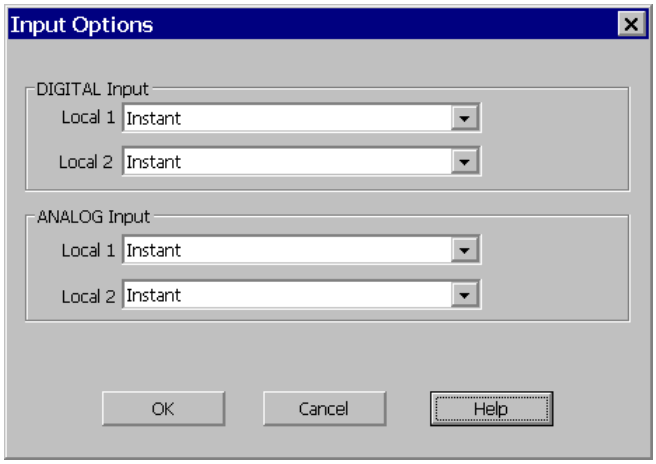
OFF Value: (000.0 to 100.0 %, default=0%) Value to output when Output Type is set to Digital. Eg. If the OFF value is 0% and the Analog Range is 0–20mA, then the Analog output when OFF will be 0mA.

Digital IO - Digital Outputs



Local Failsafe Loss Of Comms: (ON or OFF) Value to output in failsafe state. Only applicable if Loss Of Comms Failsafe has been enabled in Advanced - Configuration, Communications and the output is being controlled by the remote device.

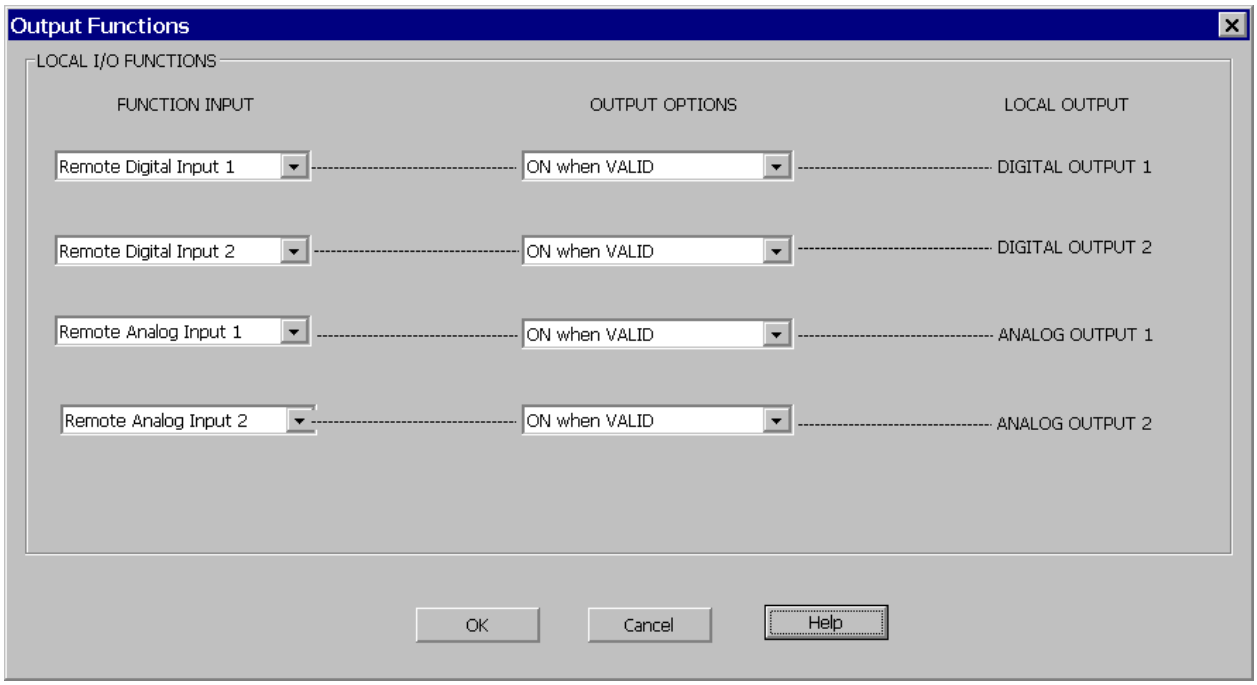
IO Functions - Input Options



Digital Input Local 1/2: (Instant) Input will be 'ON' when activated. Future versions will have other Input options such as time based and delay events.

Analog Input Local 1/2: (Instant) Input will be 'ON' when activated. Future versions will have other Input options such as time based and delay events.

IO Functions - Output Events



Output events allow each output to be controlled by one input condition and one output option.

Function Input

NOT USED: Always OFF.

System Alarm: ON when a system alarm is active. System alarms: Low Voltage, Communications Failed or Incorrect PIN.

Communications Failed: ON when the ReFlexIO has lost communications with the other ReFlexIO or Remote Host. OFF when communications have been re-established.

Invalid User PIN: ON when the user enters an incorrect PIN number 3 times. Function is OFF when the user enters a correct PIN number or power is reset.

Local Analog Input 1/2: ON when the analog input reaches the setpoint plus the deadband. OFF when the analog input falls below the setpoint minus the deadband.

Local Digital Input 1/2: ON when the digital input is energized. OFF when the digital input is connected to ground / 0 volts.

Remote Analog Input 1/2: ON when the remote analog input reaches the setpoint plus the deadband. OFF when the remote analog input falls below the setpoint minus the deadband.

Remote Digital Input 1/2: ON when the remote digital input is energized. OFF when the remote digital input is connected to ground / 0 volts.

Remote Counter 1/2: Counter to be used to output 50% duty cycle pulses according to the frequency of the remote counter value and reset time. Note: The Output Option (as detailed below) needs to be set to 'Frequency Output' for the function to work. This is useful where you would like to count an input at the remote device for a period of time, and then output that same frequency at the local device.

Example: A pulse train is connected to remote digital input 1. At the remote device, counter 1 is assigned to Digital input 1. The counter 1 value is sent to the local device at the end of the reset period and the counter is reset to zero. The count value and the reset period are also sent to the local device. The local device will then output the counter value over the reset period with a 50% duty cycle.

Output Options

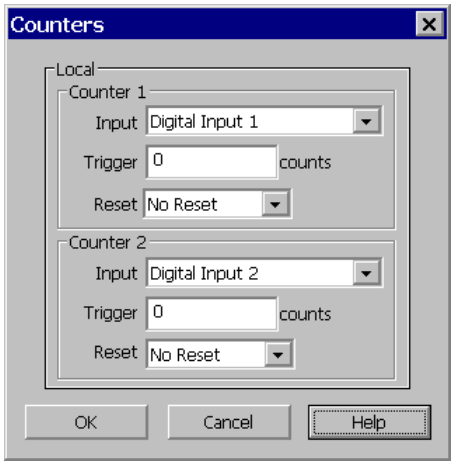
NO ACTION: Holds last IO state.

ON When Valid: For Digital Outputs, when Function Input is ON, output is set ON (closed). For Analog Outputs and Function Input = Local or Remote Analog Input, then the output follows the input. If The Function Input is an alarm or digital input and is ON, the analog output will output the configured ON Value.

OFF When Valid: For Digital Outputs, when Function Input is ON, output is set OFF (open). For Analog Outputs and Function Input = Local or Remote Analog Input, then the output is the inverted value of the input (ie. 100 - analog input %). If The Function Input is an alarm or digital input and is ON, the analog output will output the configured OFF Value.

Frequency Output: Outputs 50% duty cycle pulses according to the counter value and reset period of the Remote Counter.

Advanced - Configuration – Counters



The following options are only available when Operation Mode is set to 'ReFlexIO Back To Back Pair' in Configuration, Parameters.

Input: (Digital Input 1, Digital Input 2) The local digital input change to count.

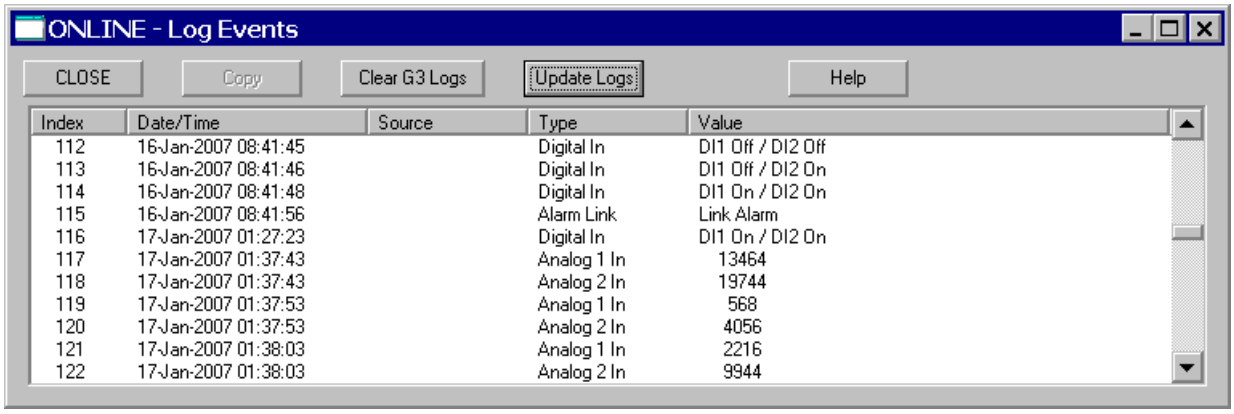
Trigger: (0-4,294,967,295) When using a Reset time (as configured below) the ReFlexIO will trigger an exception report when the counter reaches the Trigger setpoint. A setting of 0 disables this feature.

Reset: Resets the counter after this time has expired and triggers an exception report. Available options are:

- Poll period (resets after each poll)
- 1 minute (resets every minute from the beginning of the hour)
- 1 hour (resets on the hour)
- 6 hours (resets at 12PM, 6AM, 12AM and 6PM)
- 12 hours (resets at 12 noon and 12PM)
- 1 day (resets at midnight)
- 1 week (resets at midnight on Sunday)
- No Reset

(Note: the counter value can be saved in the log each time it is reset.)

Advanced - Event Logs



Index	Date/Time	Source	Type	Value
112	16-Jan-2007 08:41:45		Digital In	DI1 Off / DI2 Off
113	16-Jan-2007 08:41:46		Digital In	DI1 Off / DI2 On
114	16-Jan-2007 08:41:48		Digital In	DI1 On / DI2 On
115	16-Jan-2007 08:41:56		Alarm Link	Link Alarm
116	17-Jan-2007 01:27:23		Digital In	DI1 On / DI2 On
117	17-Jan-2007 01:37:43		Analog 1 In	13464
118	17-Jan-2007 01:37:43		Analog 2 In	19744
119	17-Jan-2007 01:37:53		Analog 1 In	568
120	17-Jan-2007 01:37:53		Analog 2 In	4056
121	17-Jan-2007 01:38:03		Analog 1 In	2216
122	17-Jan-2007 01:38:03		Analog 2 In	9944

Update Logs: Uploads all the event logs in the ReFlexIO.

Clear ReFlexIO Logs: Clears all the event logs in the ReFlexIO. If logging of system events is enabled in the ReFlexIO (as configured in Parameters, Logging), a new system log - 'Reset Logs' will be created with an index of 0.

Event Log Details
Index: (0-1000) A reference number assigned to each event log. When the event log is full, the next log generated is assigned index 0 again. The event log can be prevented from over-writing itself by enabling the Stop Logging When Log Full option in Advanced Configuration, Parameters, Logging.

Date/Time: Displayed in the following format DD-MMM-YYYY hh:mm:ss

Source: The reason for generating the event log. Possible sources are:
SYSTEM LOG: Triggered by ReFlexIO manager when the event logs are cleared or the clock is set.
DIGITAL IN: Digital inputs have changed state.
DIGITAL OUT: Digital outputs have changed state.
ANALOG IN: An analog input has changed by more than the deadband setting.
ANALOG OUT: An analog output has changed by more than the deadband setting.
ALARM: A system alarm has occurred (eg Comms, Security or Low Voltage)
COUNTER TRIG: Trigger setpoint of counter was reached.
COUNTER RESET: Counter was reset.

Type: The various types of event logs are as follows:
DIGITAL OUT: Digital output status
DIGITAL IN: Digital input status
ANALOG OUT 1: Analog output 1 value
ANALOG OUT 2: Analog output 2 value
ANALOG IN 1: Analog input 1 value
ANALOG IN 2: Analog input 2 value
ALARM LINK: Communications link status
ALARM VOLTAGE: Supply voltage status
ALARM SECURITY: Security PIN status
COUNTER 1: Counter 1 value
COUNTER 2: Counter 2 value
VOLTAGE: Supply voltage value

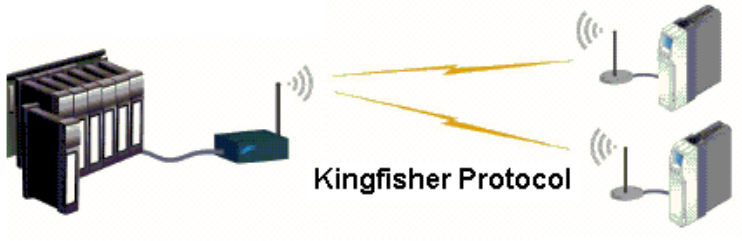
Value: For all status event logs, 0=OK and 1=Alarm. Otherwise the value displayed is the analog value or parameter. For DIGITAL inputs or outputs, 0=both Chs OFF, 1=Ch1 ON, 2=Ch 2 ON, 3=Chs 1&2 ON.

8. Communication Drivers

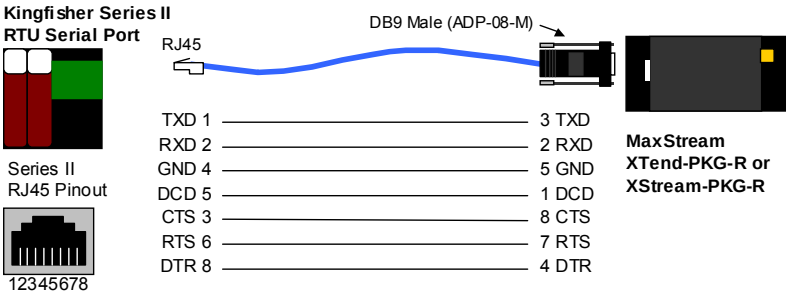
Communication drivers allow data registers to be polled from and written to a ReFlexIO. For reliable communications, these registers can be polled **every 500ms or greater**.

Driver – KF2 RTU

If the ReFlexIO is setup as a 'Remote IO' device it can then communicate with a Kingfisher Series II RTU using the KF Series II protocol. Remote IO mode allows exception reports to be sent by a ReFlexIO to a Series II RTU and allows outputs to be written to a ReFlexIO.

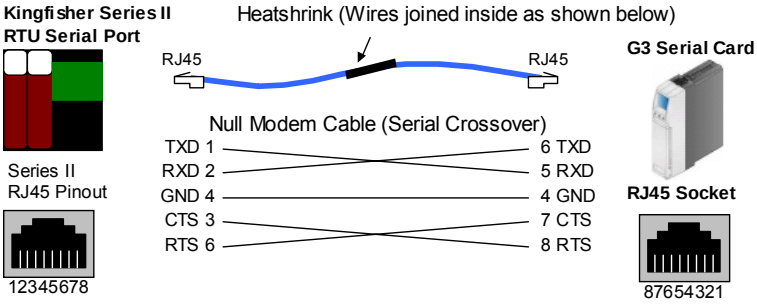


Interface Cable



Note: various other interface cables can be used (eg. for GSM or PSTN modem communications). Please see the KF II Hardware Manual (available by contacting us at www.ioselect.com) for cable details. If a spread spectrum option board is being used in the Series II RTU, an interface cable is not required.

Serial Test Cable



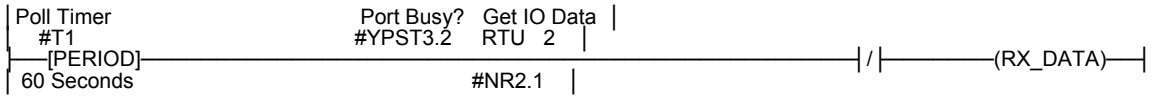
Series II RTU Setup

(Using Toolbox software)

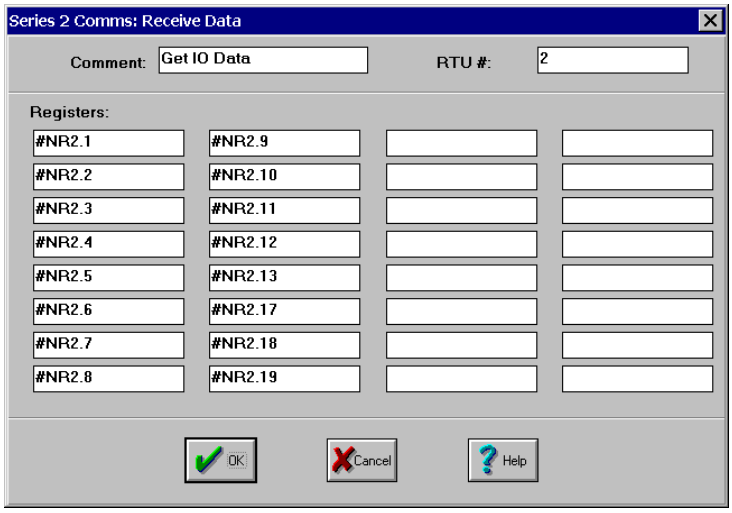
- Set the RTU address in the range 1 to 249.
- Set port **Type** to RS-232 if using a serial cable, Trio M Series Radio, MaxStream external spread spectrum radio or Spread Spectrum option board. Set port **Type** to PSTN if using a dialup modem or GSM.
- If using a Trio M Series radio, ensure **Baud Rate** is set to match the radio speed. If using a spread spectrum radio option board, set **Baud Rate** to 9600 (for 9XTend US / Australian radio) or 19200 (for 24XStream International radio).
- For all setups, **Pre TX** and **Post TX** can be left set to 0 ms and **Protocol** can be left set to 'Series 2'.
- Network List – add a link with the ReFlexIO device address and the port number of the communications device as configured above.
- Phone Directory – if using a dialup modem or GSM, configure a phone number corresponding to the ReFlexIO address.
- If using a spread spectrum radio (option board or external), please initialise it with the settings detailed in the chapter - Using Communication Devices, MaxStream External Spread Spectrum Radio.

Polling A ReFlexIO Using A Series II RTU

Configure ladder logic to poll *network* registers from the ReFlexIO using the RX DATA block (an example is shown below)



The above example polls the ReFlexIO (address 2) every 60 seconds, provided that port 3 is not busy. The RX Data block was setup as shown below.



Exception Reporting from a ReFlexIO to a Series II RTU

When a ReFlexIO exception reports it sends the first 12 registers as detailed below. Exception reporting is setup in the ReFlexIO as detailed in the topic Advanced - Configuration - Communications.

ReFlexIO Kingfisher Registers

Register *	Description
#NRrrr.1	Ch 1 (LSB) = Digital input 1 status Ch 2 = Digital input 2 status
#NRrrr.2	Analog input 1. 0-26208 = 0-100% = 0-20mA or 4-20mA For over-range: 0-20mA input: 0-32760 = 0-125% = 0-25mA 4-20mA input: 0-34398 = 0-131.25% = 4-25mA
#NRrrr.3	Analog input 2. Same range as above.
#NRrrr.4	General alarms Ch 1 ON = Comms Fail Ch 2 ON = Low Voltage alarm Ch 3 ON = Incorrect PIN alarm
#NRrrr.5	Supply Voltage to the ReFlexIO (0 to 300 = 0.0 to 30.0V)
#NRrrr.6	SS radio received signal strength. There are two ranges depending on which type of radio is installed. 0= no signal received **9XTend radio (900MHz):** -110 (weak) to -40 (strong) dBm **24XStream radio (2.4GHz):** 6 (weak) to 54 (strong) The 9XTend signal strength is stored as 65426 to 65496 (unsigned) = -110 to -40 (signed) dBm.
#NRrrr.7	ReFlexIO internal temperature. -20 to 70°C (already scaled)
#NRrrr.8	Status indications Ch 1 ON = IO Scanning ON Ch 2 ON = if ReFlexIO in override mode, IO data has changed. Ch 3 ON = log buffer is ≥90% full (=900 logs) Ch 4 ON = new counter 1 value Ch 5 ON = new counter 2 value (Remote ReFlexIO sends counter value and then resets it back to zero)
#NRrrr.9 and #NRrrr.10	Counter 1. 32-bit long integer (1 to 4,294,967,296)
#NRrrr.11 and #NRrrr.12	Counter 2. 32-bit long integer (1 to 4,294,967,296)
#NRrrr.13	Counter periods. Used by remote ReFlexIO for frequency generator outputs. Ch 1 - 15: Index into counter table Ch 16 ON = Use table (ms): 500, 1000, 5000, 30 000, 60 000, 90 000, 180 000, 360 000, 86 400 000 Ch 16 OFF = Use table (s): 0, 60, 3600, 21 600, 43 200, 604 800
#NRrrr.14	Ch 1 = DO1 raw output state – Read/Write # Ch 2 = DO2 raw output state – Read/Write #
#NRrrr.15	AO1 raw output value. 0-26208=0-100% - Read/Write #
#NRrrr.16	AO2 raw output value. 0-26208=0-100% - Read/Write #
#NRrrr.17	Ch 1 = DO1 actual output state - Read only Ch 2 = DO2 actual output state - Read only
#NRrrr.18	AO1 actual output value. 0-26208=0-100% - Read only
#NRrrr.19	AO2 actual output value. 0-26208=0-100% - Read only

* rrr = ReFlexIO address

The raw outputs are modified by the ReFlexIO output options before the actual output is set.

Setting ReFlexIO Outputs Using A KF2 RTU

The following *network* registers can be sent to a ReFlexIO to set the outputs:

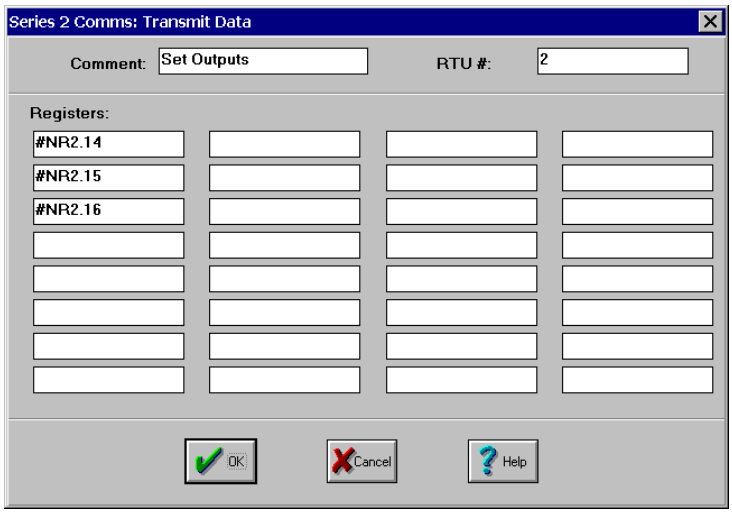
#NRrrr.14	Ch 1 = DO1 output state Ch 2 = DO2 output state
#NRrrr.15	AO1 output value (0-26208=0-100%)
#NRrrr.16	AO2 output value (0-26208=0-100%)

Where 'rrr' is the ReFlexIO address to set the outputs in.

Notes:

- Only *network* registers (eg #NR2.14) can be sent to the ReFlexIO. *Local* registers (eg #R14) will not be accepted.
- To set outputs in a ReFlexIO, first set the network register(s) in the Series II and then send the network register(s) to the ReFlexIO using a TX DATA block.
- When sending a digital output, the *whole* register is sent to the ReFlexIO (eg #NRrrr.14) and not just a single bit (eg #NRrrr.14.1).
- The ReFlexIO applies any configured output options and events to all new outputs.

An example TX Data block that will write to all the ReFlexIO outputs (address 2) is shown below.



Polling The ReFlexIO Outputs

To check the state of the ReFlexIO outputs, the read-only registers #NRrrr.17, #NRrrr.18 and #NRrrr.19 can be polled from the ReFlexIO. These registers contain a copy of the actual ReFlexIO outputs. The output registers #NRrrr.14, #NRrrr.15 and #NRrrr.16 can also be polled. However, if a user is about to set the ReFlexIO outputs in the Series II RTU and a poll occurs at the same time, the user settings will be overwritten by the polled data.

Uploading Event Logs From A ReFlexIO

Event logs can be uploaded from a ReFlexIO using a Kingfisher Series II RTU and the Rx Update ladder logic block. The Series II RTU will upload all the logs since the index of the last log that was uploaded. If no logs have been uploaded then the Series II RTU will upload all the logs in the ReFlexIO.

Driver - Modbus

By setting the Factory Defaults to 'Modbus Slave', the ReFlexIO will then respond to Modbus messages received by its option card. The ReFlexIO will not initiate exception reports in this mode. All the ReFlexIO Modbus registers listed below can be read using a Modbus message (note: if registers outside the listed range are requested, a comms fail will occur). Only Modbus registers 40014, 40015, and 40016 can be written to. The ReFlexIO supports the following Modbus function codes: FC03 Read Holding Registers, FC06 Preset Single Register and FC16 Preset Multiple Registers.

Direct to G3 from your SCADA PC using Modbus

Direct to G3 from Operator display panel (HMI) with Modbus

Direct to G3 from PLC using Modbus

Direct to G3 from RTU using Modbus

Setting ReFlexIO Outputs Using Modbus

When setting a digital output, the *whole* Modbus register is sent to the ReFlexIO (ie. 40014) and not just a single bit (eg. 40014.1). The ReFlexIO then applies any configured output options and events to all new outputs.

ReFlexIO Modbus Registers

Register	Description
40001	Ch 1 (LSB) = Digital input 1 status Ch 2 = Digital input 2 status
40002	Analog input 1. 0-26208 = 0-100% = 0-20mA or 4-20mA For over-range: 0-20mA input: 0-32760 = 0-125% = 0-25mA 4-20mA input: 0-34398 = 0-131.25% = 4-25mA
40003	Analog input 2. Same range as above.
40004	General alarms Ch 1 ON = Comms Fail Ch 2 ON = Low Voltage alarm Ch 3 ON = Incorrect PIN alarm
40005	Supply Voltage to the ReFlexIO (0 to 300 = 0.0 to 30.0V)
40006	SS radio received signal strength. There are two ranges depending on which type of radio is installed. 0= no signal received **9XTend radio (900MHz):** -110 (weak) to -40 (strong) dBm **24XStream radio (2.4GHz):** 6 (weak) to 54 (strong) The 9XTend signal strength is stored as 65426 to 65496 (unsigned) = -110 to -40 (signed) dBm.
40007	ReFlexIO internal temperature. -20 to 70°C (already scaled)
40008	Status indications Ch 1 ON = IO Scanning ON Ch 2 ON = if ReFlexIO in override mode, IO data has changed. Ch 3 ON = log buffer is ≥90% full (=900 logs) Ch 4 ON = new counter 1 value Ch 5 ON = new counter 2 value (Remote ReFlexIO sends counter value and then resets it back to zero)
40009 and 40010	Counter 1. 32-bit long integer (1 to 4,294,967,296)
40011 and 40012	Counter 2. 32-bit long integer (1 to 4,294,967,296)
40013	Counter periods. Used by remote ReFlexIO for frequency generator outputs. Ch 1 - 15: Index into counter table Ch 16 ON = Use table (ms): 500, 1000, 5000, 30 000, 60 000, 90 000, 180 000, 360 000, 86 400 000 Ch 16 OFF = Use table (s): 0, 60, 3600, 21 600, 43 200, 604 800
40014 *	Ch 1 = DO1 raw output state – Read/Write [#] Ch 2 = DO2 raw output state – Read/Write [#]
40015 *	AO1 raw output value. 0-26208=0-100% - Read/Write [#]
40016 *	AO2 raw output value. 0-26208=0-100% - Read/Write [#]
40017	Ch 1 = DO1 actual output state - Read only Ch 2 = DO2 actual output state - Read only
40018	AO1 actual output value. 0-26208=0-100% - Read only
40019	AO2 actual output value. 0-26208=0-100% - Read only

* Only registers 40014, 40015 and 40016 can be written to. Writing to any other registers will result in a comms fail.

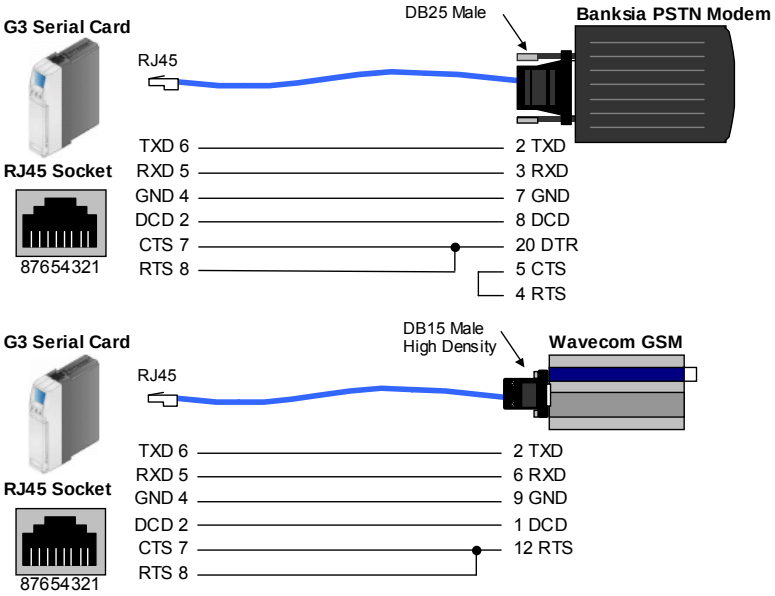
[#] The raw outputs are modified by the ReFlexIO output options before the actual output is set.

9. Using Communication Devices

The serial option card allows various external communication devices to be connected and used with a ReFlexIO. The ReFlexIO does not support initialisation strings or hardware flow control and so these settings must first be configured in the communication device as detailed below.

PSTN Modems and GSMs

Interface Cables



Software Settings

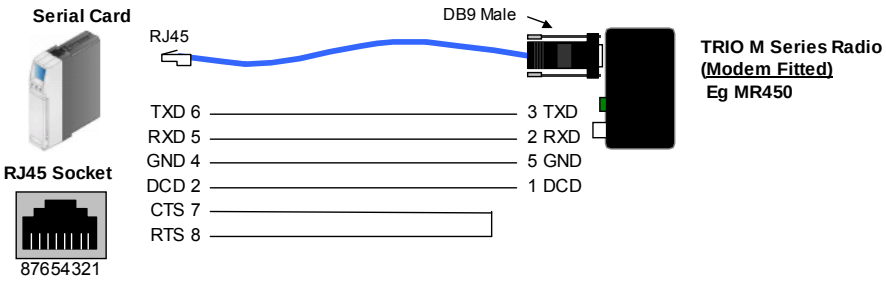
The following settings have been confirmed to work with Banksia PSTN modems (MyModem56V) and Wavecom GSMs (WM02-G900). These modems require a number of settings that can be configured by connecting the modem to your PC COM port and then setting the following AT commands using Windows HyperTerminal (data format: 8 data bits, no parity and 1 stop bit).

Wavecom GSM	
AT <enter>	Modem responds with OK if communicating with the PC correctly
ATS0=2 <enter>	Auto answer after 2 rings
AT&D0 <enter>	Ignore DTR
AT&S0 <enter>	DSR always ON
AT+IFC=0,0 <enter>	Do not use hardware flow control
AT&W <enter>	Save settings to permanent memory

Banksia PSTN Modem	
AT <enter>	Modem responds with OK if communicating with the PC correctly
ATS0=2 <enter>	Auto answer after 2 rings
AT&D0 <enter>	Ignore DTR
AT&S0 <enter>	DSR always ON
AT&K0 <enter>	Do not use hardware flow control
AT&W <enter>	Save settings to permanent memory

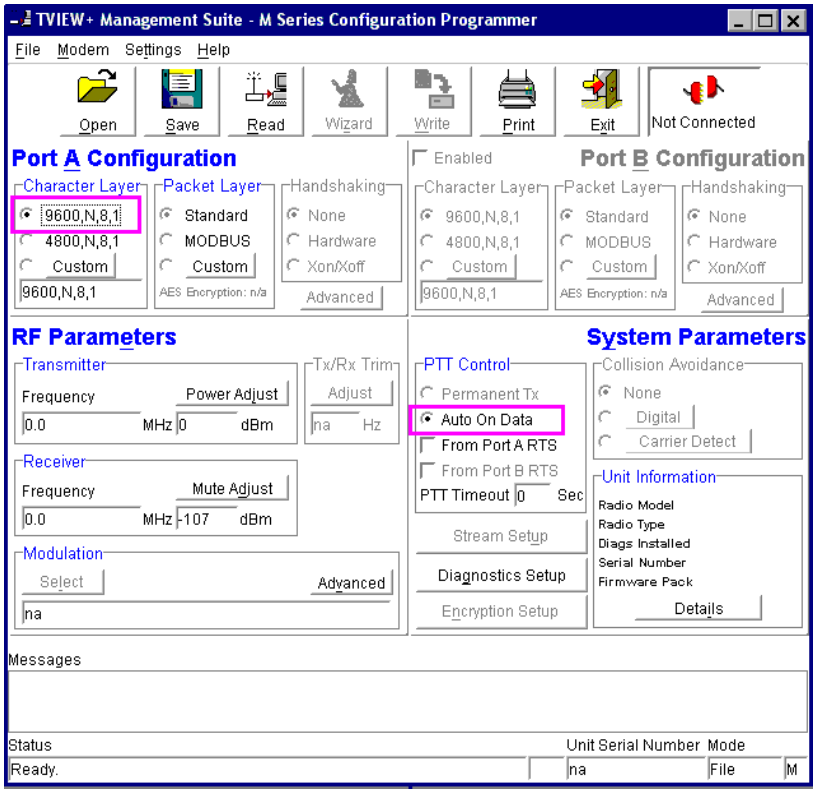
Trio M Series Radio

Interface Cable



Software Settings

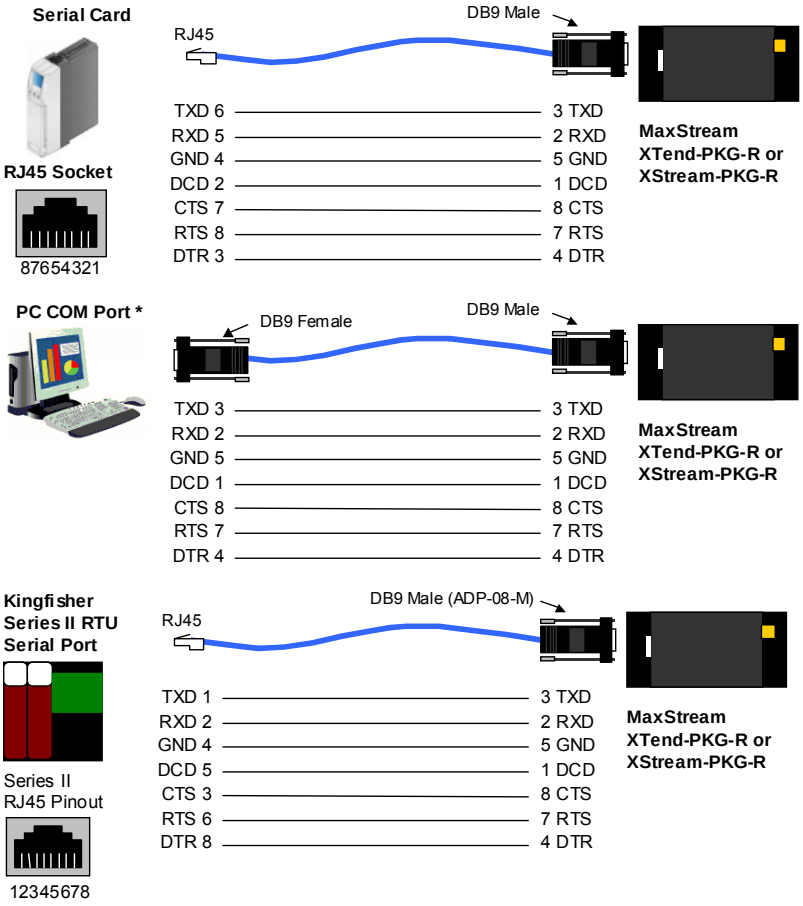
Trio M Series radios are configured using the Trio TVIEW software. When configuring each radio, please ensure the radio uses the same baud rate as the ReFlexIO serial card (typically 9600 bps) and **PTT Control** is set to **Auto On Data**. These settings are highlighted below.



MaxStream External Spread Spectrum Radio

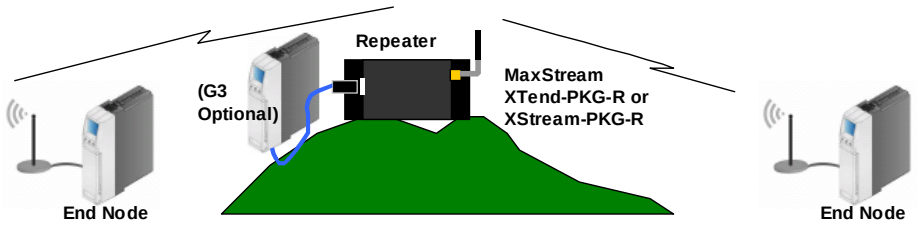
The following information applies to using a MaxStream external spread spectrum radio with a ReFlexIO, a PC or with another communications device (eg display panel).

Interface Cables


Serial Card
RJ45
DB9 Male
TXD 6 — 3 TXD
RXD 5 — 2 RXD
GND 4 — 5 GND
DCD 2 — 1 DCD
CTS 7 — 8 CTS
RTS 8 — 7 RTS
DTR 3 — 4 DTR
MaxStream XTend-PKG-R or XStream-PKG-R
RJ45 Socket
87654321
PC COM Port *
DB9 Female
DB9 Male
TXD 3 — 3 TXD
RXD 2 — 2 RXD
GND 5 — 5 GND
DCD 1 — 1 DCD
CTS 8 — 8 CTS
RTS 7 — 7 RTS
DTR 4 — 4 DTR
MaxStream XTend-PKG-R or XStream-PKG-R
Kingfisher Series II RTU Serial Port
Series II RJ45 Pinout
12345678
RJ45
DB9 Male (ADP-08-M)
TXD 1 — 3 TXD
RXD 2 — 2 RXD
GND 4 — 5 GND
DCD 5 — 1 DCD
CTS 3 — 8 CTS
RTS 6 — 7 RTS
DTR 8 — 4 DTR
MaxStream XTend-PKG-R or XStream-PKG-R

* A USB version of the MaxStream radio is also available. A standard USB cable can then be used to connect the radio to a USB port on a PC.

Spread Spectrum Repeater Setup

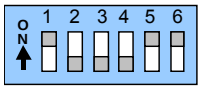


The ReFlexIO internal spread spectrum radio cards are automatically configured to operate as End Nodes. End Nodes can communicate directly with one another. A repeater can also be added between any 2 end nodes to extend the radio coverage. Please refer to Software Settings below to configure the repeater radio.

Radio Switch Settings

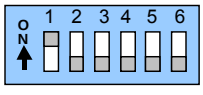
Please ensure that the MaxStream radio switches are set as follows (note: there are no switch settings on the USB version):

XTend



Set for: RS232, RS485 termination=None and TX/RX mode=User Defined (Switch 1, 5 and 6 set ON)

XStream



Set for: RS232, RS485 termination=None and Parity=None (Switch 1 ON)

Software Settings – Using MaxStream X-CTU Software

Note: radios in a network can only communicate if they have the same settings for Vendor ID and Hopping Channel.

- Connect a powered up MaxStream radio to your PC's COM port (eg COM1).
- Run the MaxStream X-CTU program supplied with the radio.
- From the **PC Settings** tab, ensure X-CTU is setup to use the right COM port, 9600 baud (XTend) or 19200 baud (XStream), 8 data bits, no parity and 1 stop bit.
- Click the **Test / Query** button to check communications to the radio.
- From the **Modem Configuration** tab, click the **Read** button. All the radio settings will be read into the program.
- From the **Networking & Security** section of the radio settings:
  Set **Hopping Channel** to the same number as all the other radios in your network.
  Set **Destination Address** to **FFFF** Hex.
  Set **Source Address** to a unique value in your network (all radios in the network should have a different Source Address in the range 0-FFFF Hex).
  Set **RF Mode** to **Repeater** or **Repeater End Node (**Repeater is used to relay messages to another radio and will also allow the local radio to communicate).
  Note: **Modem VID** (**Vendor ID)** should be set to the same number as all the other radios in your network. This can be set using a terminal program as described below.
- If using an XTend radio, scroll down to the **RF Interfacing** section of the radio settings and change BR to 0 (ie. set RF data rate to 9600 bps).
- Click the 'Write' button. The settings will now be written and saved in the radio.

Software Settings – Using A Standard Terminal Program *

Radio parameters can be set using Windows HyperTerminal (or the Terminal window in the MaxStream X-CTU software). Once connected to the radio, type +++ to put the radio in command mode. Then enter the relevant AT commands below. Note: radios in a network can only communicate if they have the same settings for Vendor ID and Hopping Channel.

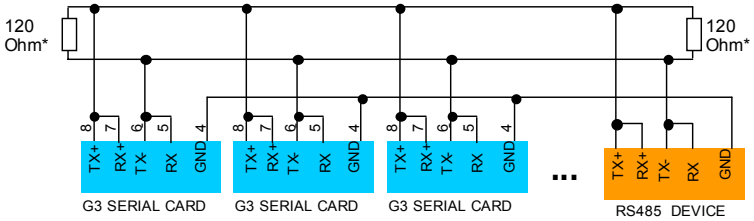
+++	Radio responds with OK when ready to receive commands
ATRE <enter>	Reset the radio to factory defaults
ATHP0 <enter>	Set Hopping Channel to 0 (default) or in the range XTend 0-9, XStream 0-6
ATDTFFFF <enter>	Set Destination Address to FFFF Hex.
ATMY15 <enter>	Set Source Address to eg. 15 (must be unique) or in the range 0-FFFF Hex
ATID3332 <enter>	Set Vendor ID to 3332 Hex (default) or in the range XTend 0-7FFF Hex, XStream 10-7FFF Hex.
ATMD5 <enter>	Set RF Mode For XTend: 5=Repeater, 6=End Node. For XStream: 3=Repeater, 4=End Node.
ATBR0 <enter>	Only required if using an XTend radio. Sets RF data rate to 9600 baud.
ATWR <enter>	Save settings to permanent memory

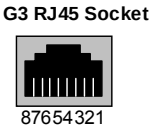
* When configuring a Kingfisher Series II RTU Spread Spectrum Option card, the Toolbox Comms Terminal is used. Setup the Comms Terminal to use the Remote RTU Port Number that corresponds to the option card and then enter the above settings.

RS485 Device

Interface Cable

Each ReFlexIO can communicate with another ReFlexIO or device connected to the RS485 bus. Only one ReFlexIO or device can talk at a time. Maximum RS485 Wire Length: 600m.





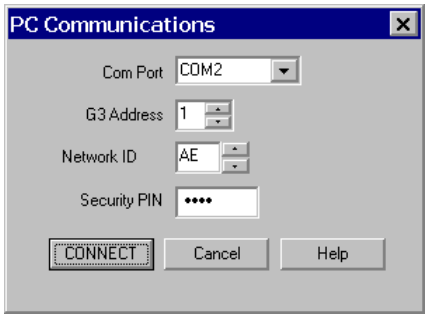
* Line termination recommended for 38400 baud

Software Settings

Ensure that the ReFlexIO Serial Card is setup to operate in RS485 mode. Please see the topic Configuration, Comms, Serial Card.

10. Upgrading Firmware

After connecting a ReFlexIO to your PC's USB port, select the menu *Tools, Download Firmware*. The communications dialog box will appear.



Click CONNECT to attempt to communicate with the ReFlexIO. If communications are successful, ReFlexIO Manager will check the ReFlexIO's hardware version. There are 2 versions of ReFlexIO hardware: v1.05 or v1.07 and newer. These can be loaded with firmware files '**ReFlexIO_[version].ReFlexIO5'** and '**ReFlexIO_[version].ReFlexIO7**' respectively.

If the hardware version can be detected or if a previous download failed, you will be prompted with a firmware selection dialog box. Select the firmware file that matches your ReFlexIO hardware version.

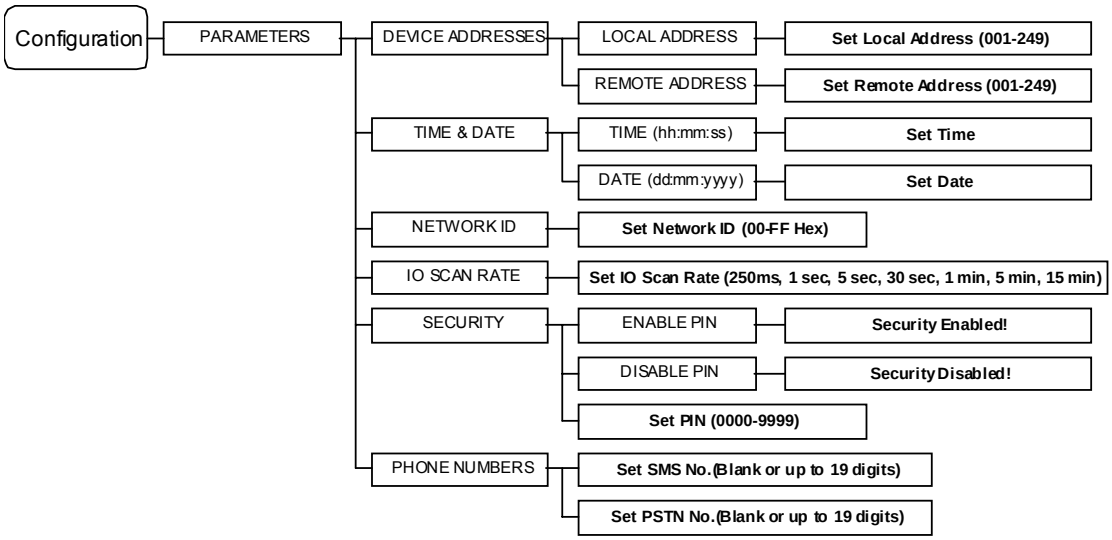
Manually Checking The Hardware Version

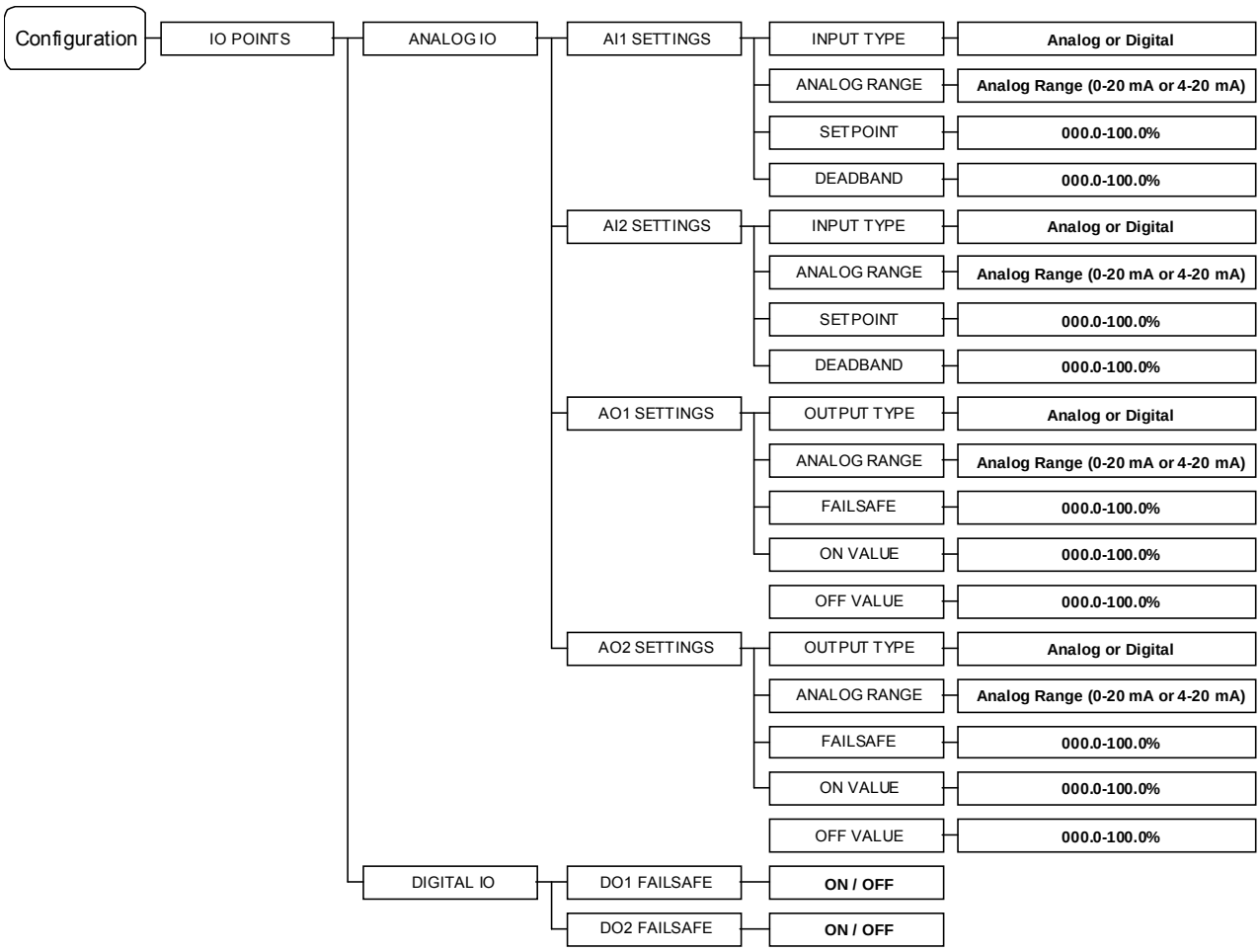
Remove the left hand (when looking from the front) side cover by inserting a flat screwdriver into the screwdriver slot on the back of the ReFlexIO. Gently push the screwdriver in at an angle (around 45 degrees). The side cover will then separate from the ReFlexIO case. The hardware version is written in the top right hand corner of the circuit board.

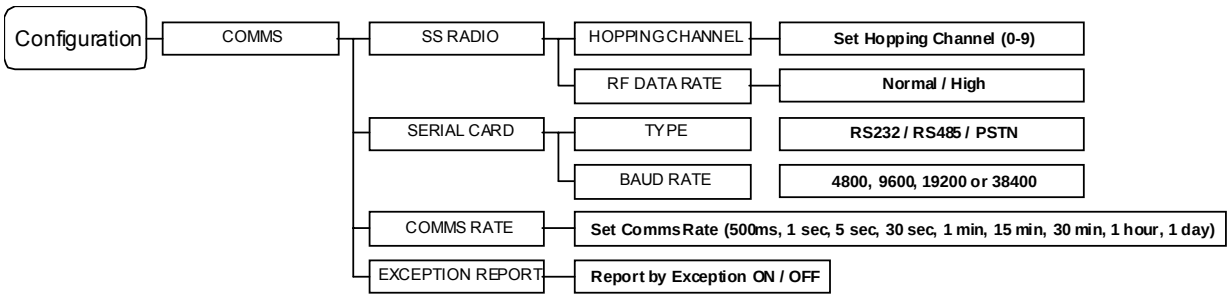
While downloading firmware, the OLED and LEDs are switched off. If a firmware download fails (eg. comms are interrupted during download), the OLED and LEDs will remain switched off. Firmware can still be downloaded again provided the ReFlexIO is powered up.

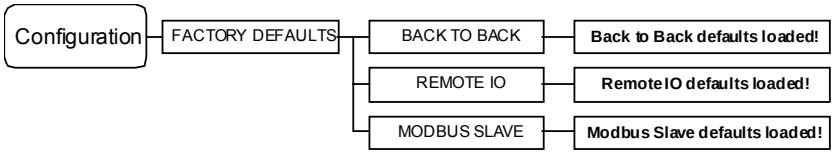
If the download is successful, the new firmware version will be displayed on the ReFlexIO Startup Screen.

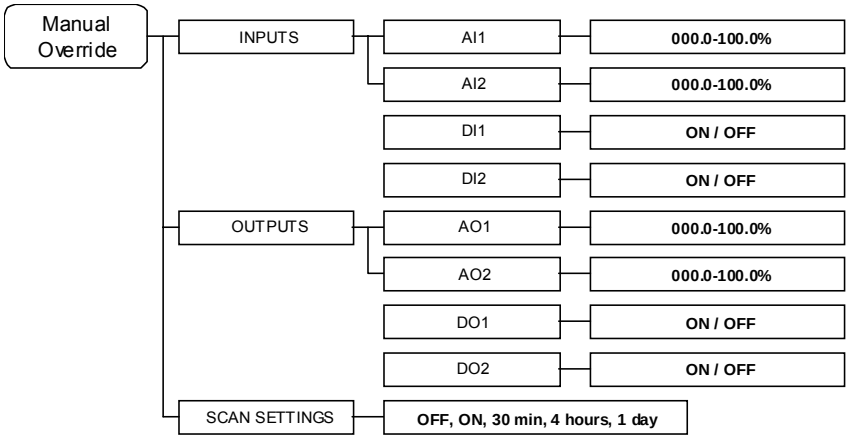
11. ReFlexIO Display Map






Configuration
COMMS
SS RADIO
HOPPING CHANNEL
Set Hopping Channel (0-9)
RF DATA RATE
Normal / High
SERIAL CARD
TYPE
RS232 / RS485 / PSTN
BAUD RATE
4800, 9600, 19200 or 38400
COMMS RATE
Set Comms Rate (500ms, 1 sec, 5 sec, 30 sec, 1 min, 15 min, 30 min, 1 hour, 1 day)
EXCEPTION REPORT
Report by Exception ON / OFF


Configuration
FACTORY DEFAULTS
BACK TO BACK
Back to Back defaults loaded!
REMOTE IO
RemoteIO defaults loaded!
MODBUS SLAVE
Modbus Slave defaults loaded!


Manual Override
INPUTS
AI1
000.0-100.0%
AI2
000.0-100.0%
DI1
ON / OFF
DI2
ON / OFF
OUTPUTS
AO1
000.0-100.0%
AO2
000.0-100.0%
DO1
ON / OFF
DO2
ON / OFF
SCAN SETTINGS
OFF, ON, 30 min, 4 hours, 1 day

12. Factory Default Settings

IO Settings	Back to Back / Remote IO / Modbus Slave
Digital Inputs	
DI1: Type	Discrete
DI2: Type	Discrete
Analog Inputs	
AI1: Input Type	Analog
AI1: Analog Range	0-20mA
AI1: Threshold	75%
AI1: Dead Band	10%
AI2: Input Type	Analog
AI2: Analog Range	0-20mA
AI2: Threshold	75%
AI2: Dead Band	10%
Digital Outputs	
DO1: Type	Discrete
DO1: Failsafe	OFF
DO2: Type	Discrete
DO2: Failsafe	OFF
Analog Outputs	
AO1: Output Type	Analog
AO1: Analog Range	0-20mA
AO1: Failsafe	0%
AO1: ON Value	100%
AO1: OFF Value	0%
AO2: Output Type	Analog
AO2: Analog Range	0-20mA
AO2: Failsafe	0%
AO2: ON Value	100%
AO2: OFF Value	0%

Programming Settings	Back to Back / Remote IO / Modbus Slave
DO1: Output Option	ON/Follow
DO1: Event Type1	Remote DI1
DO1: Event Type2	Not Configured
DO2: Output Option	ON/Follow
DO2: Event Type1	Remote DI2
DO2: Event Type2	Not Configured
AO1: Output Option	ON/Follow
AO1: Event Type1	Remote AI1
AO1: Event Type2	Not Configured
AO2: Output Option	ON/Follow
AO2: Event Type1	Remote AI2
AO2: Event Type2	Not Configured

Timers	Back to Back / Remote IO / Modbus Slave
Keypad Lockout Time	1800 seconds (30 minutes)
Analog Log Timer	3600 seconds (1 hour)
Screen Shutdown Time	300 seconds (5 minutes)

Options	Back to Back / Remote IO / Modbus Slave
Save DI to Log	ON
Save DO to Log	ON
Save System Alarms to Log	ON
Save System Events to Log	ON
Save AI to Log	OFF
Save AO to Log	OFF
Save Counter on reset to log	OFF
Set bit when log reaches 90%	OFF
Do not Log after Full	OFF
Log Counter on Setpoint reached	OFF
Date Format	DDMMYY

General Settings	Back to Back	Remote IO	Modbus Slave
IO Scan Rate	1 sec		
Poll Rate	1 min	1 hour	Disabled
Exception Reporting	ON		Disabled
Communications Timeout	800 ms		
Number of Retries	5		
Date & Time	HH:MM:SS PM, DD/MM/YYYY		
Network ID	AE		
Security	OFF		
PIN Number	1000		
Low Voltage Setting	10.8V		
Low Power Mode Setting	OFF		
Wake up method	TIMED		
Control Mode Scan Settings	ON & Exit		

Comms Settings	Back to Back / Remote IO / Modbus Slave
Spread Spectrum Tx Power	1000 mW (9XTend), 50 mW (24XStream)
Spread Spectrum RF Data Rate	9600 bps
Spread Spectrum Vendor ID	ID=13106
Spread Spectrum Dest. Address	DT=65535 (FFFF Hex)
Spread Spectrum Hopping Channel	HP=0
Spread Spectrum Repeater Mode	XTend: MD=6 (End Node); XStream: MD=4 (End Node) Always operates as an End Node. Can be used with a Spread Spectrum Radio in Repeater mode.
Serial Card Baud Rate	4800 bps
Serial Card Interface Type	RS232
SMS Paging Defaults	No phone number, No analog input triggers, Digital inputs enabled
PSTN Phone Number	None
PSTN Dial Retries	0
PSTN Dial Timeout, Online Inactivity, Hang Up After	60 seconds
PSTN Initialisation String	AT&FTE0V0S0=2&W

Counters	Back to Back / Remote IO / Modbus Slave
Counter 1 Input	DI1
Counter 2 Input	DI2
Counters 1 and 2 Trigger	10
Counters 1 and 2 Reset	No Reset

13. Specifications

General	
Configuration / Diagnostic Port	Mini USB 2.0 (host powered) A USB to Mini USB cable is used by ReFlexIO Manager to communicate between a PC and a ReFlexIO.
Communications options	Spread Spectrum Radio or Serial Card (RS232/RS485)
Supported Protocols	Modbus Slave, KF Series II
OLED Display	Mono or Color 96 x 64 pixel OLED (Organic Light Emitting Diode) Displays 19 characters x 8 lines of text
LEDs (left to right)	LED1: Power ON = power OK, flashing = power low LED2: IO Scan ON = IO scanning, flashing = IO not scanning LED3: Comms ON = comms message in progress LED4: Alarm Flashing = system alarm (typically comms fail)
Push buttons	Three - UP (left), DOWN (middle) and ENTER (right)
Log Capacity	1000
Log Accuracy	1 second
Compliance	CE, FCC, CSA, UL, C Tick (pending) Zone 2 (Class One, Div 2) compatible for use in hazardous areas This Class B digital apparatus complies with Canadian ICES-003.
Communications Links	1
Failsafe Outputs	Yes
Real Time Clock	Yes
Operating Temperature	-40 to 70°C
Relative humidity	5 to 95% (non-condensing)

Electrical	
Supply Voltage (to POWER IN terminal) from suitable customer power supply	9 to 30V DC, nominally 12V or 24V. Input has a 1A resettable fuse, reverse and over-voltage protection.
Current Consumption	20 mA @ 12VDC minimum 400 mA @ 12VDC with 1W spread spectrum radio transmitting 600 mA @ 12VDC with radio transmitting and output current at max. 200 mA @ 30VDC with 1W spread spectrum radio transmitting 400 mA @ 30VDC with radio transmitting and output current at max. 500 mA @ 9VDC with 1W spread spectrum radio transmitting 700 mA @ 9VDC with radio transmitting and output current at max.
Output Current (via POWER OUT terminal)	200mA maximum. Excessive over-current polyfuse protected. (Uses supply voltage applied to POWER IN terminal)
Monitoring	Supply Voltage, Low Supply Voltage alarm

Analog Inputs	
Number of inputs	2
Current Range	0-20mA or 4-20mA Can read up to 25mA for over-range inputs.
Protection	Surge and transient protection up to a 10MJ pulse and up to 5V continuous. Over current and over voltage protected.
Resolution	12-bit ADC
Accuracy	± 0.25 % @ 25°C
Maximum Voltage	5 VDC
Input impedance	250Ω

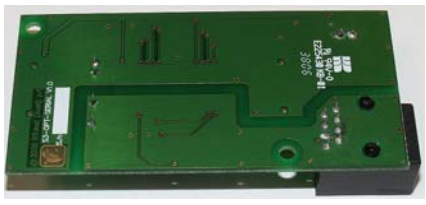
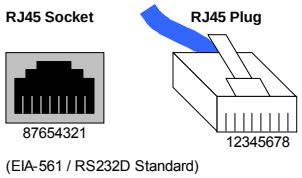
Analog Outputs	
Number of outputs	2
Current Range	0-20mA or 4-20mA Can output up to 25mA for over-range outputs.
Protection	Surge and transient protection up to a 10MJ pulse and 35V continuous. Over and reverse voltage protected.
Resolution	12-bit DAC
Accuracy	± 0.25 % @ 25°C
Maximum Load	1275Ω @ 30VDC analog output supply voltage * Note: Max. Load = (VDCin - 0.5)/0.02 - 200 Ω VDCin = Voltage supply used to drive analog output

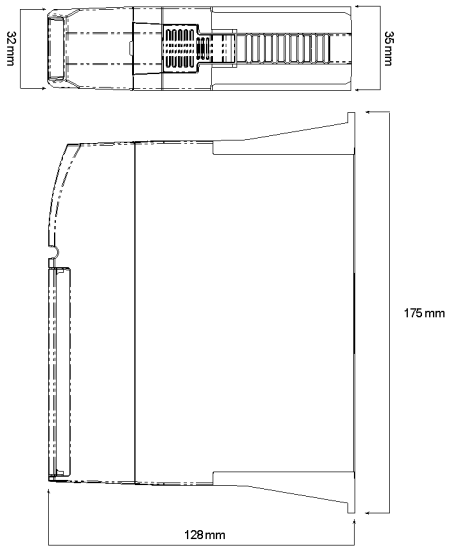
Digital Inputs	
Number of inputs	2 to 4 (analog inputs can be configured as digital inputs)
Input Voltage Range	3 to 30VDC = ON 0 to 1.4VDC = OFF
Protection	Surge and transient protection up to a 10MJ pulse and up to 50V continuous.
Input Impedance	150 kΩ
Pulse Counting	2Hz maximum Pulse must have ON and OFF times of at least 250ms each.

Digital Outputs	
Output Type	Open drain, sinking to ground
Number of outputs	2 to 4 (analog outputs can be configured as digital outputs)
Switching Voltage	30 VDC maximum (switches to ground)
Switching Current	200 mA maximum
Protection	Surge and transient protection up to 500MJ pulse.
Pulse Outputs	2 Hz maximum, 50% duty cycle.

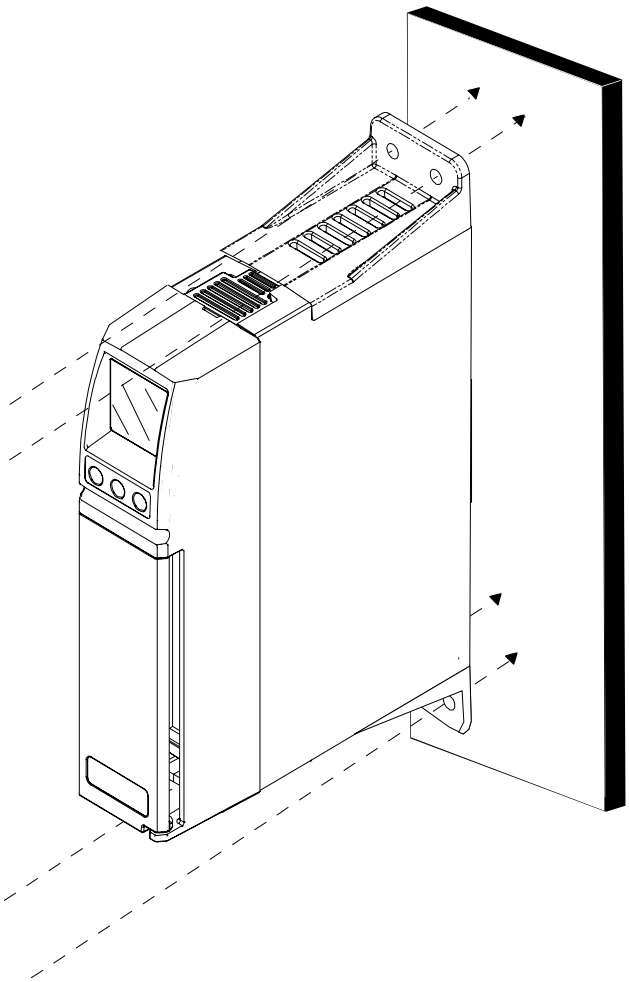
Spread Spectrum Radio Option Please see www.maxstream.net/products for more information		
Parameter	**9XTend**	**24XStream**
Picture		
Countries Supported	USA, Canada, Australia *	International
Frequency	902-928MHz (USA, Canada) 915-928MHz (Australia)	2.4000-2.4835GHz
Transmit Power	1-1000 mW configurable	50 mW
Range Indoors	Up to 900 m	Up to 180 m
Range Outdoors (must have line of sight)	Up to 22 km	Up to 5 km
Range with Yagi (must have line of sight)	Up to 32 km	Up to 8 km
RF Data Rate	115200 or 9600 bps	9600 bps
Power Consumption	3.7W maximum	0.75W maximum
Spread Spectrum Type	FHSS (Frequency Hopping Spread Spectrum)	
Antenna Connector	RPSMA (reverse polarity SMA) Male (on radio)	
Receiver Sensitivity	-110dBm @ 9600 bps	-105 dBm
Operating Temperature	-20 to 70°C	

* The 9XTend radio for Australia is slightly different to the model for the USA and Canada.

Serial Option Card				
Baudrate	4800, 9600, 19200 or 38400 bps			
Data Format	8 data bits, no parity bit, 1 stop bit			
Interface Types	RS232 or RS485			
Operating Temperature	-40 to 70°C			
Isolation	2.5 kV			
RS485 Line Drive	32 Receivers			
RJ45 Socket Pinout	Pin	RS232	RS485 (4 Wire)	 (EIA-561 / RS232D Standard) Note: Kingfisher Series II RTUs use different pin numbering.
	1	DSR	N/C	
	2	DCD	N/C	
	3	DTR	N/C	
	4	GND	GND	
	5	RXD	RX-	
	6	TXD	TX-	
	7	CTS	RX+	
	8	RTS	TX+	

Dimensions	
Overall	175mm H x 35 mm W x 128 mm D (includes mounting brackets)
	

14. Mounting Instructions

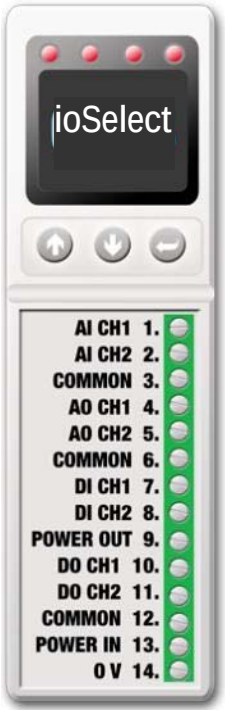


Use 4 screws to attach the ReFlexIO to a suitable flat mounting surface.

Ensure there is adequate ventilation below and above the unit and that any objects do not obstruct the ventilation holes.

15. Ordering

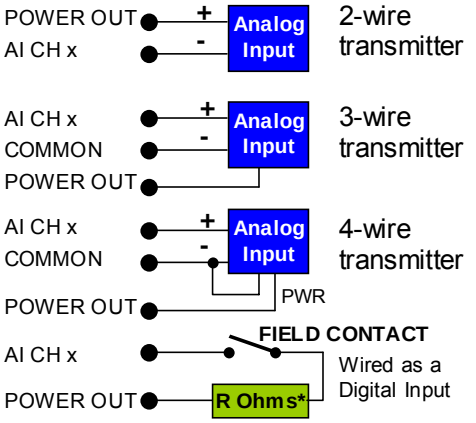
16. Wiring Diagram



Max. IO and Power Out wire length: 30 metres.

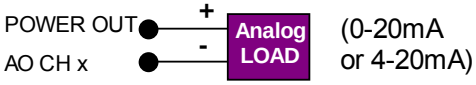
IO POWERED BY ReFlexIO

ANALOG INPUTS (0-20 or 4-20 mA)

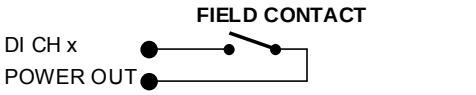


* Use R=470Ω 0.5W if Power Out=12VDC
or use R=1.2KΩ 1W if Power Out=24VDC
This will provide an input of ~16mA

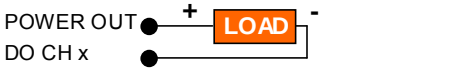
ANALOG OUTPUTS



DIGITAL INPUTS

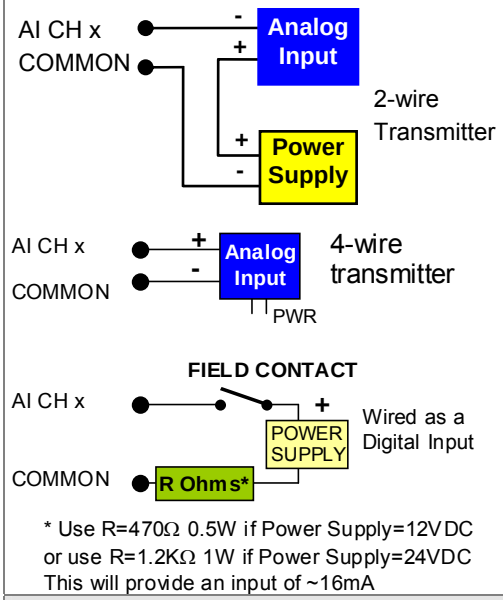


DIGITAL OUTPUTS



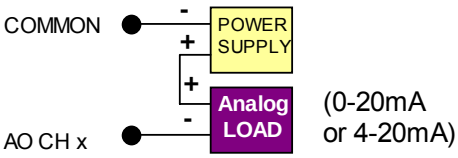
IO POWERED EXTERNALLY

ANALOG INPUTS (0-20 or 4-20 mA)

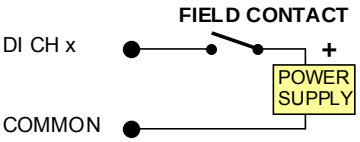


* Use R=470Ω 0.5W if Power Supply=12VDC
or use R=1.2KΩ 1W if Power Supply=24VDC
This will provide an input of ~16mA

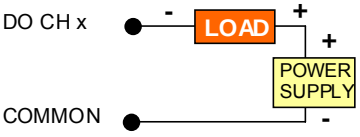
ANALOG OUTPUTS



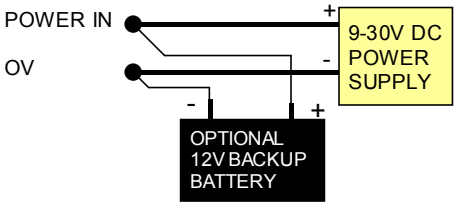
DIGITAL INPUTS



DIGITAL OUTPUTS

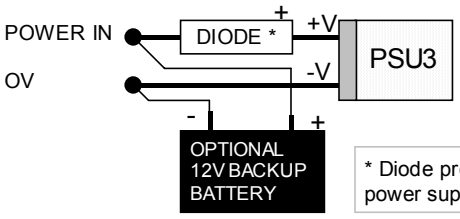


INPUT POWER



Adjust to 13.8V DC when using a backup battery.

Max. power supply to POWER IN wire length: 10 metres.



AC/DC Power supply available from RTUnet. Adjust to 14.4V DC when using a backup battery. Note: the PSU3 should be installed according to local regulations.

* Diode prevents the battery discharging through the PSU3 power supply. Use 1N5404 diode or equivalent (3 amp)